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Access to Research and Technical Information in Denmark

Report to The Danish Agency for Science, Technology and Innovation (FI) and Denmark's Electronic Research Library (DEFF)

Annex II
Survey Results

By John Houghton, Centre for Strategic Economic Studies, Victoria University and Alma Swan and Sheridan Brown, Key Perspectives Limited

Innovation: Analyse og evaluering 20/2011

April 2011

Acknowledgements

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The research team for this project included: John Houghton of The Centre for Strategic Economic Studies at Victoria University, Alma Swan and Sheridan Brown of Key Perspectives Limited.

Disclaimer

April 2011

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The following is a simple question-by-question description of the results for each category of respondents, namely: (*i*) all respondents, (*ii*) researchers (*i.e.* respondents in research roles), (*iii*) incubator firms and (*iv*) innovating firms (*i.e.* those having introduced new or improved products or services in the last three years). A summary appears in the body of the report.

All respondents

There were a total of 98 usable responses, although not all answered all of the questions and some questions sought multiple responses and it is the share of total responses that is reported. Hence, wherever the presentation deviates from N=98 it is noted.

Demographics

The survey began with questions about the respondents and their firms.

Q1 In what year was your firm established?

The year of establishment of the respondents' firms ranged from 1861 to 2010. Two firms reported establishment in the 19th century, 45 in the 20th century and 49 were established since 2000, including 34 since 2005 and 4 in 2010 (N=97).

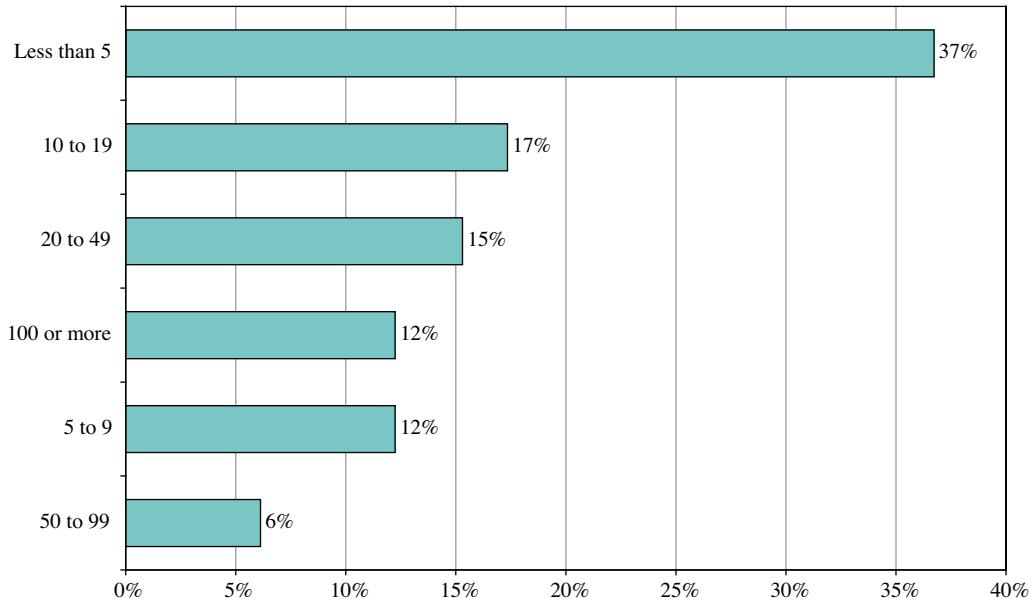
Q2 Are you or have you ever been involved with the national scheme of innovative incubators "Innovationsmiljoerne"?

Incubator firms in Denmark have close ties to the universities, and 33% (30 firms) reported being participants in the national incubators scheme "Innovationsmiljoerne" (N=92).

Q3 Approximately, how many employees are there in your firm?

The firms were typically small, with 37% (36 firms) reporting less than 5 employees and a further 12% reported employing between five and nine – although 12% (12 firms) reported employing 100 or more people (N=98).

Figure AQ3 Size of firms (number of employees)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q4 Approximately, what is your firm's annual revenue from SALES (on average over the last 3 years)?

Reported annual sales revenue varied, with a number of start-up firms not yet making sales and reporting zero sales revenue and 12 firms reporting sales revenue in excess of DKK 100 million per year. The average was around DKK 130 million per year (N=90).

Q5 Approximately, what is your firm's annual R&D spending (on average over the last 3 years)?

Reported R&D spending also varied significantly, from little or none to as much as DKK 80 million per year. A number of early stage firms reported R&D spending greater than sales and a small number of start-up firms reported R&D spending of DKK 3 to 7 million per year and zero revenue. Overall, the firms reported average annual R&D spending of DKK 5.7 million on sales of DKK 130 million, or 4% (N=81).

Q6 Which best describes the main activity of your firm?

Sixty-four per cent (61 firms) described their activities as manufacturing, 21% (20 firms) as services and 16% (15 firms) as software/content (N=96).

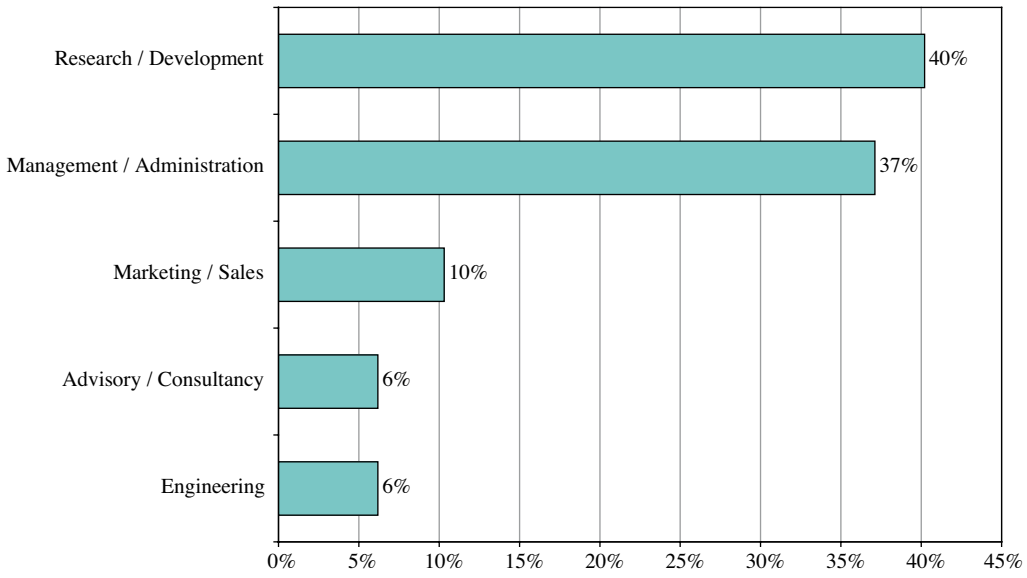
Q7 Which of the following industry categories best describes what your firm does?

At a more detailed level, 24 firms categorized their activities under manufacturing, 9 construction, 9 information and communication, 9 knowledge-based services, 7 human health and social work, and 14 other services (N=91).

Q8 What is your main role within your firm?

Respondents were mainly in research and/or management, with 40% reporting research roles and 37% management. However, it is worth noting that in a number of the smaller firms respondents performed multiple, and sometimes all, roles. A few respondents were in specialist marketing and sales, engineering and advisory roles (N=97).

Figure AQ8 Main role of respondents in their firm



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Information needs, access levels and costs

The second section of the questionnaire explored the respondents' information needs, how they discover and access information, and whether there are any barriers to access or gaps in what is available to them.

Q9 How important is it that you have access to the types of information listed below?
(On a scale of "not at all important" to "extremely important")

Figure AQ9 shows the respondents' rankings of the importance of various information types (N=98).

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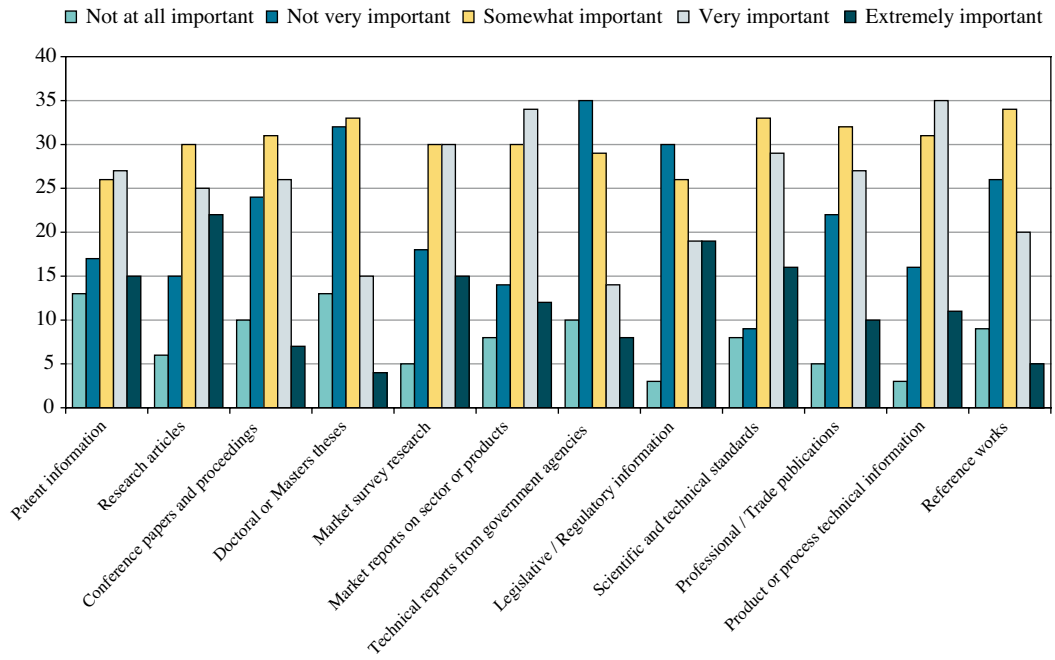
Figure AQ9 Importance of each information type



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Asked to rank the importance of various types of information on a scale from 1 (not at all important) to 5 (extremely important) respondents' ranked research articles, scientific and technical standards, and product or process technical information highest (average score 3.4), followed by market survey research, market reports on sector or products (average score 3.3), and legislative/regulatory information and professional and trade publications (average score 3.2).

Forty-eight per cent of respondents rated research articles as very or extremely important, 47% rated product or process technical information and market reports on sectors or products as very or extremely important, 46% rated scientific and technical standards and market survey research as very or extremely important, and 43% rated patent information as very or extremely important.

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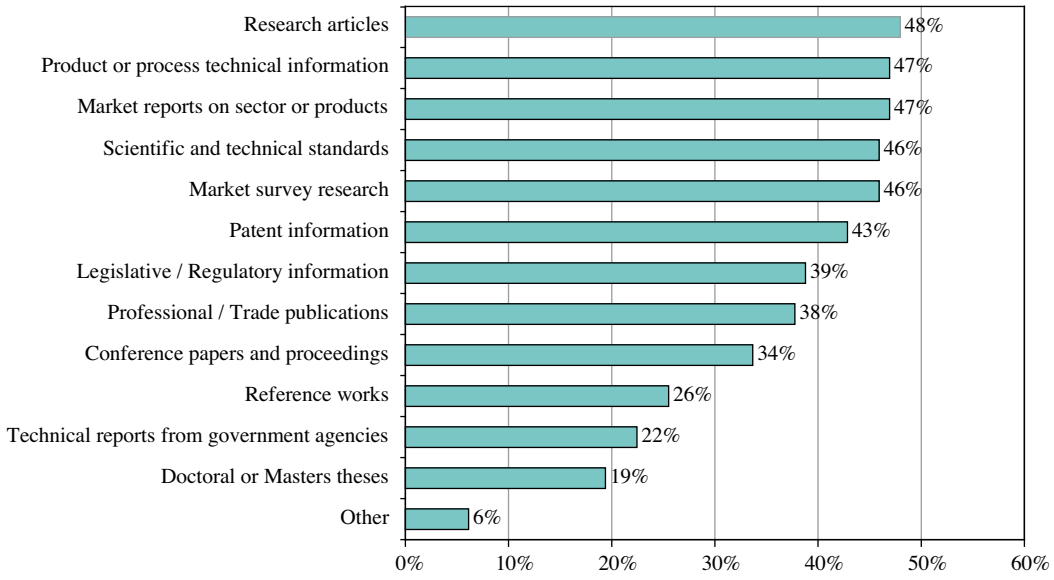
Figure AQ9a Average importance rating on a scale of 1 (not at all important) to 5 (extremely important)

Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure AQ9b Percentage rating information type as very or extremely important

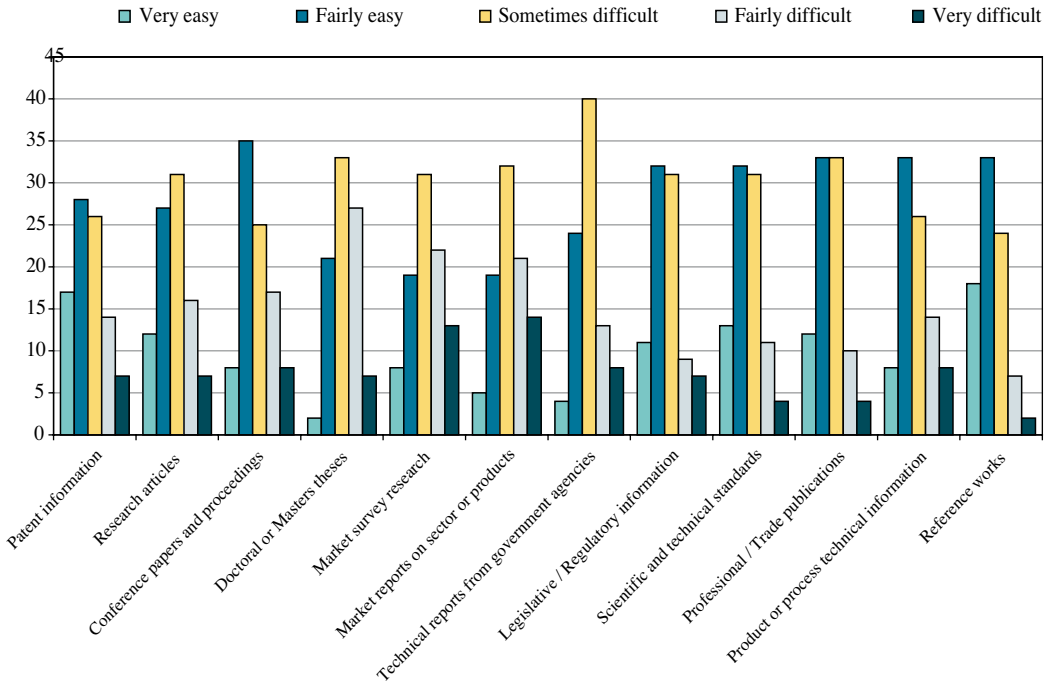


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q10 How easy is it for you to gain access to the FULL TEXT content of the information you need?
(On a scale of "very easy" to access the full text content to "very difficult")

Asked how easy it was for them to gain 'full text' access to these various types of information it was clear that many experience some access difficulties (N=95).

Figure AQ10 Ease of access to each information type



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Asked to rate the ease of gaining access to the 'full text' of various types of information on a scale from 1 (very easy) to 5 (very difficult) respondents' rated reference works (average score 2.3), scientific and technical standards, professional/trade publications and patent information (average 2.6) and legislative/regulatory information (average 2.7) the easiest to access in full. Market reports on sector or products and Doctoral and Masters theses (average 3.2) were rated as the most difficult of the information types to access in full.

More than two-thirds of respondents reported having difficulties accessing market reports on sector or products, Doctoral or Masters theses and market survey research, 62% reported difficulties accessing technical reports from government agencies, and 55% reported difficulties accessing research articles.

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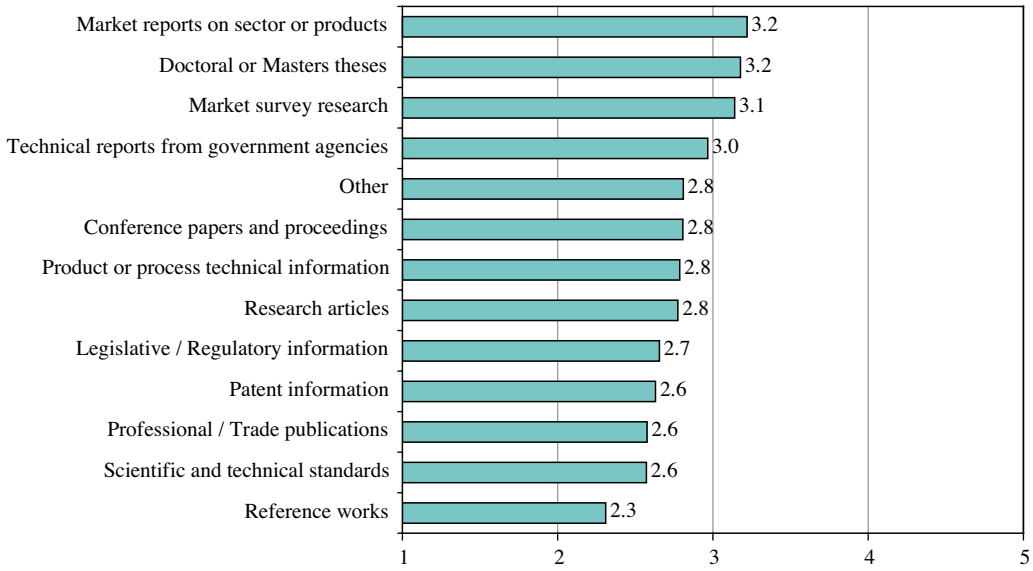
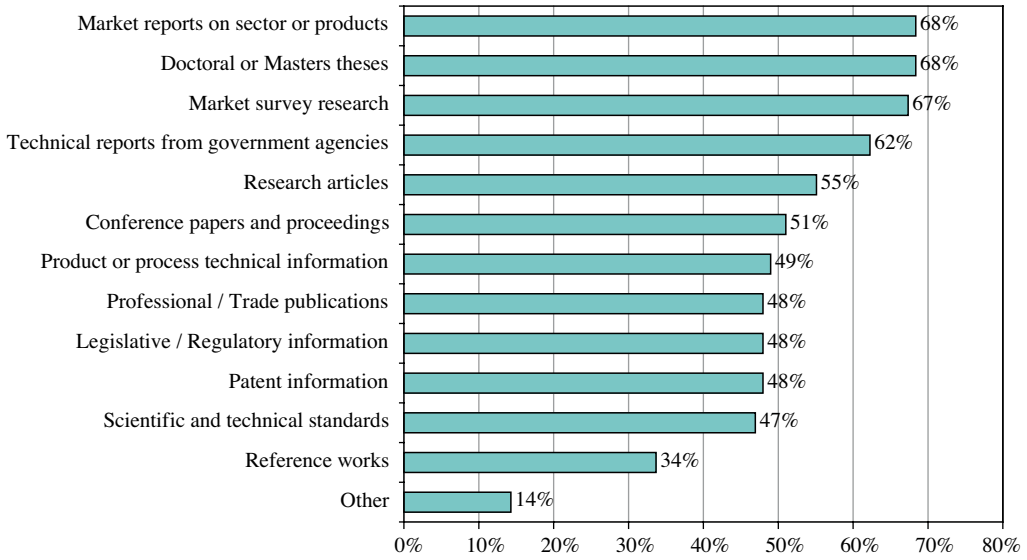
Figure AQ10a Average access difficulty rating on a scale of 1 (very easy) to 5 (very difficult)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure AQ10b Percentage for who access is very, fairly or sometimes difficult

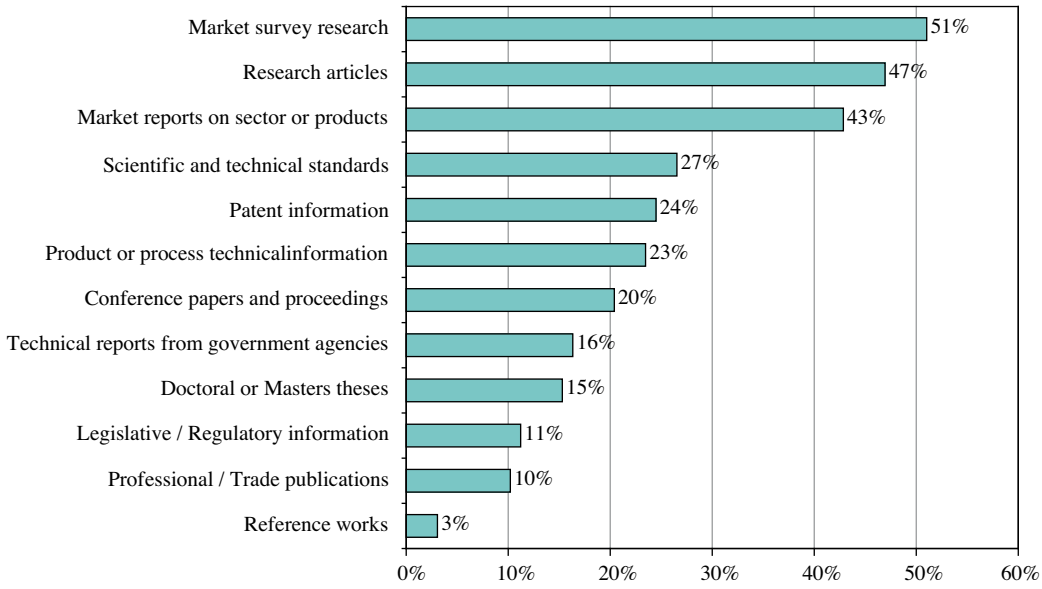


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q11 If you could improve access to any of these types of information, which would you choose?

To further explore their access needs and priorities, respondents were asked which of the information types they would like to have improved access to. More than 50% sought better access to market survey research (51%), 47% sought improved access to research articles, and 43% sought improved access to market reports on sector or products (N=92). Twenty per cent or more sought improved access to scientific and technical standards (27%), patent information (24%), product and process technical information (23%) and conference papers and proceedings (20%).

Figure AQ11 Percentage of respondents wanting improved access by information type

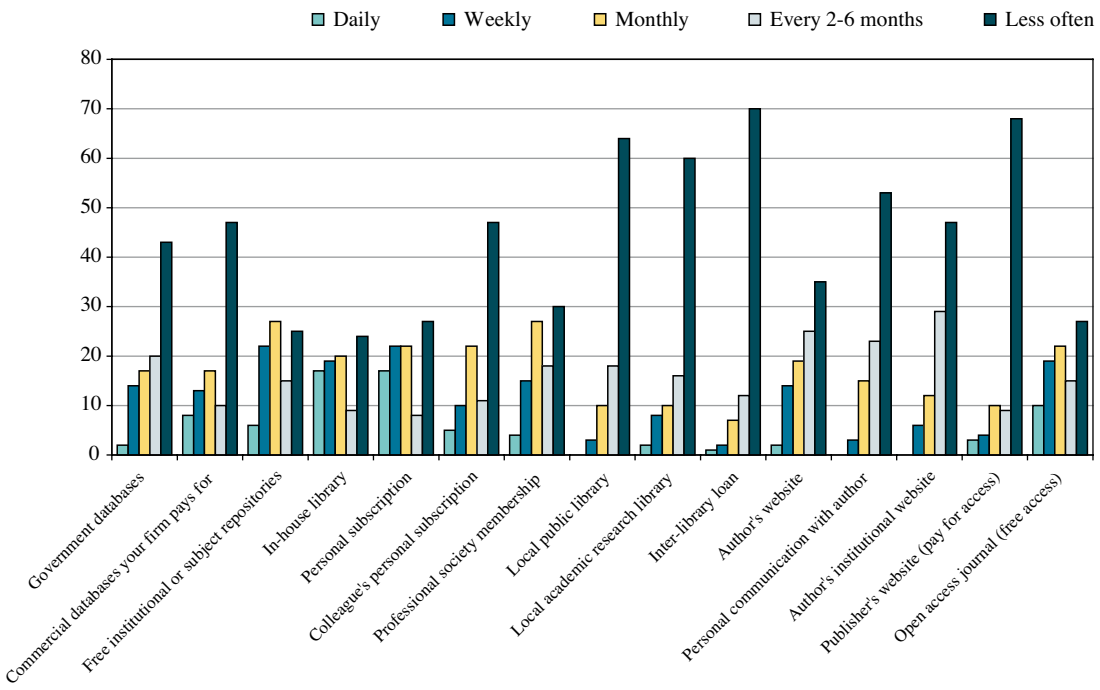


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q12 How often do you use the following ways to access the FULL TEXT content of the information you need?

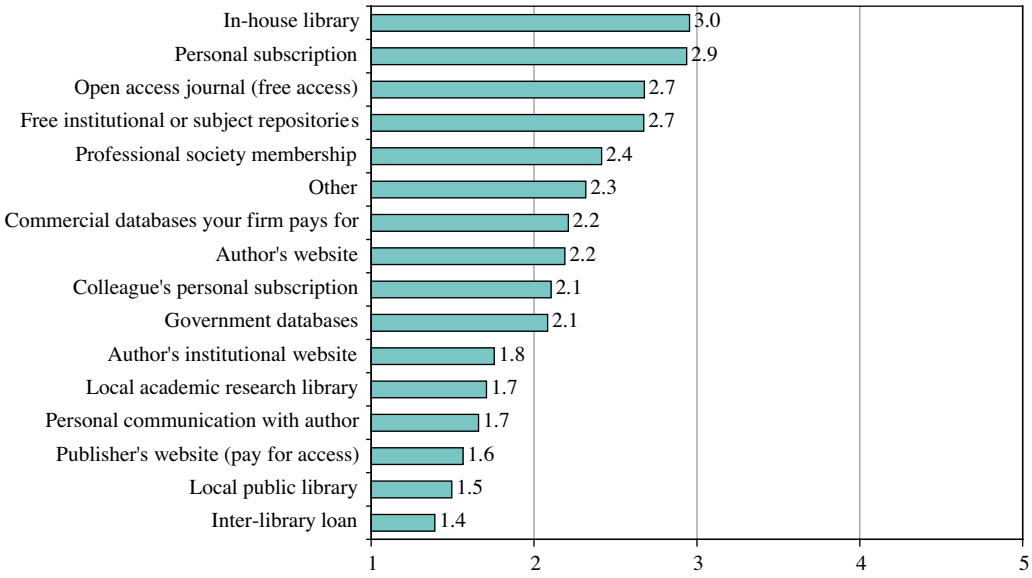
Turning to search and discovery and frequency of access and use, respondents were asked how frequently they used various means of access to the information they need (N=96). In-house libraries were the most commonly used access means, followed by personal subscriptions, open access journals and free institutional or subject repositories, and professional society membership. The least frequently used methods include inter-library loan, local public library and publishers' websites (*e.g.* pay-per-view).

Figure AQ12 Frequency of access by access methods



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

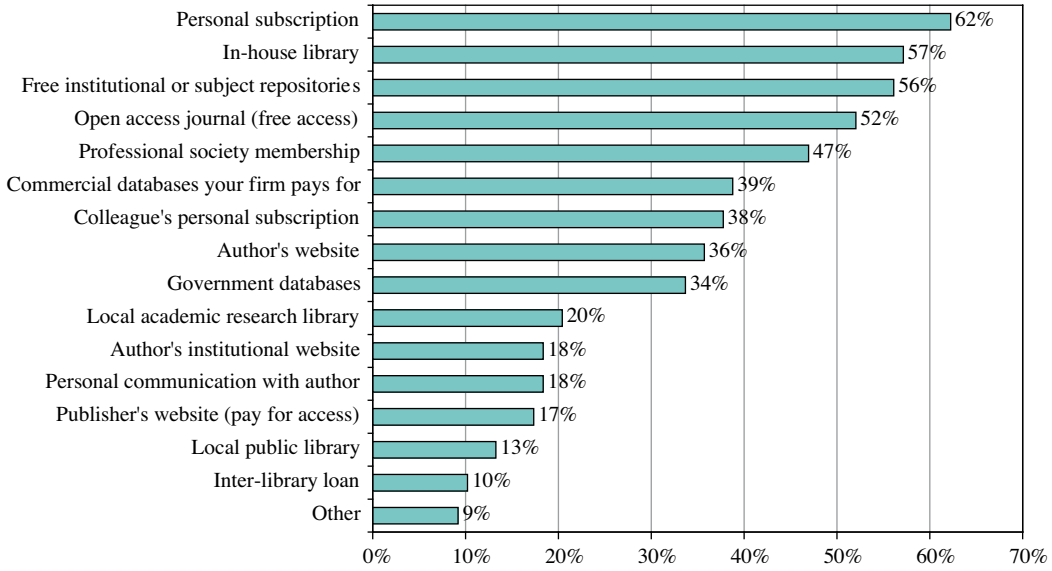
Figure AQ12a Average frequency of access by method on a scale of 1 (less often than every 2-6 months) to 5 (daily)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Some 62% of respondents reported using personal subscriptions monthly or more frequently, between 50% and 60% of respondents reported using and in-house library, free institutional or subject repositories and open access journal (free access), and 47% professional society membership. Just 17% reported using pay-per-view access from publishers' websites, and less than 15% reported using inter-library loans or the local public library monthly or more frequently.

Figure AQ12b Percentage of respondents using these access methods on a monthly basis or more frequently



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Other methods of access reported included one report of direct communication with R&D departments of relevant companies and institution, and, perhaps rather confusing discovery and access, four reports of Google or Google Scholar.

Q13 Approximately, how often do you read or consult research articles, either in journals or individually, and in either print or electronic form?

Looking specifically at access and use of research articles, respondents were asked how often they read or consulted research articles, either in journals or individually, and in either print or electronic form. No less than 68% of respondents reported reading or consulting research articles on a monthly or more regular basis, 45% on a weekly or more regular basis and 10% on a daily basis (N=96).

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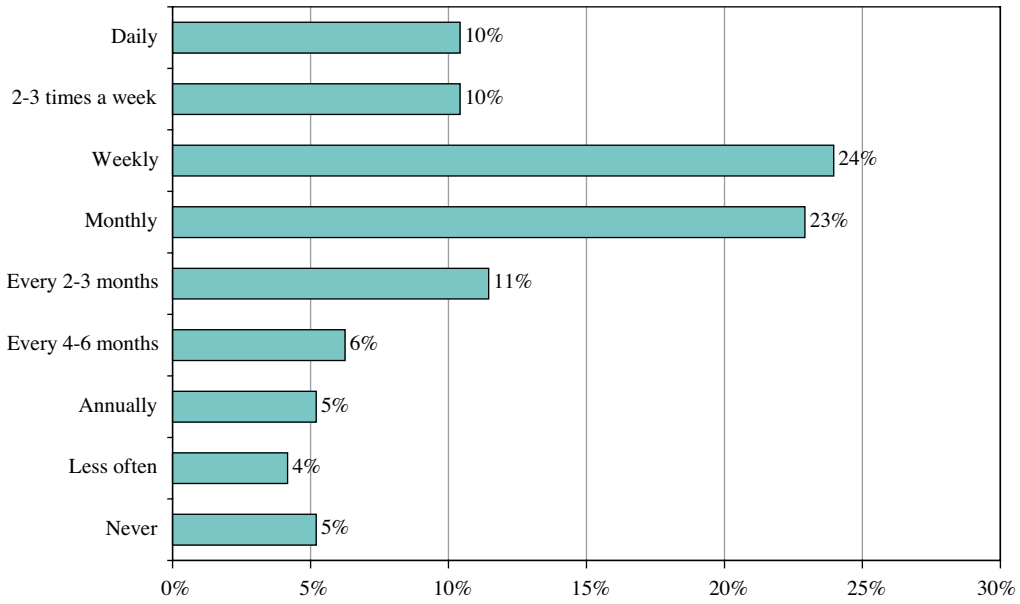
Figure AQ13 Frequency of reading or consulting research articles



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

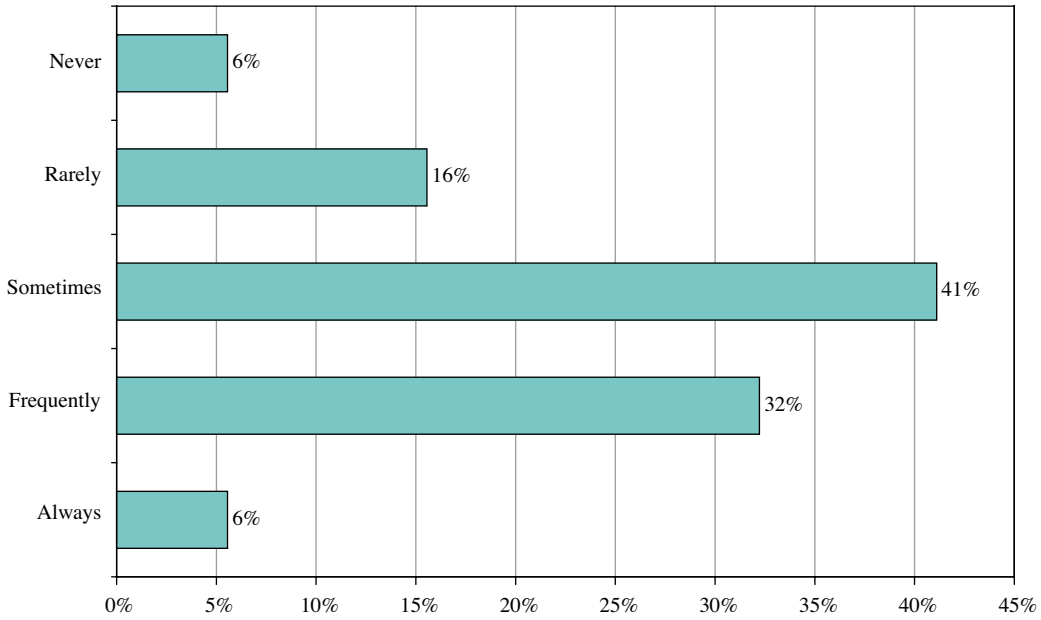
Q14 Approximately, how many research articles do you read or consult each year, either in print or electronic form?

Asked how many research articles they read or consult each year, respondents offered a wide range of responses. Eight respondents reported reading or consulting 200 or more, 14 reported 100 or more and 28 (33%) reported reading 50 or more. Moreover, two reported reading or consulting "many" and one reported reading or consulting "a few hundred", but having not specified a number could not be included in the counts, and there were two problematic responses reporting very high numbers. Excluding these responses, the average was 53 articles read or consulted per year (N=81).

Q15 Do you have any difficulty accessing the FULL TEXT of the research articles you need?

Asked about the frequency of access difficulties relating to research articles, 38% of respondents said they always or frequently had difficulty getting the research articles they needed, and a further 57% said they sometimes or rarely had difficulties. Just 6% reported that they never experienced access difficulties (N=90).

Figure AQ15 Frequency of access difficulty relating to research articles



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q16 During the past 12 months, approximately how many research articles did you find it difficult to access?

The number of research articles respondents had difficulty accessing during the last year varied from 1 or 2 up to 200 and more. Excluding the problematic responses noted above (Question 14), the average was 21 articles presenting difficulties during the last year (N=68).

Given that they report reading or consulting an average of 53 per year, access difficulties were equivalent to 39% of readings (including open access article readings).

Q17 In relation to the LAST RESEARCH ARTICLE YOU HAD DIFFICULTY ACCESSING, how important was it to gain access to the full text of the article? ***(On a scale of 1 "not at all important" to 5 "extremely important")***

Respondents attached importance to the articles they had difficulties accessing (N=78).

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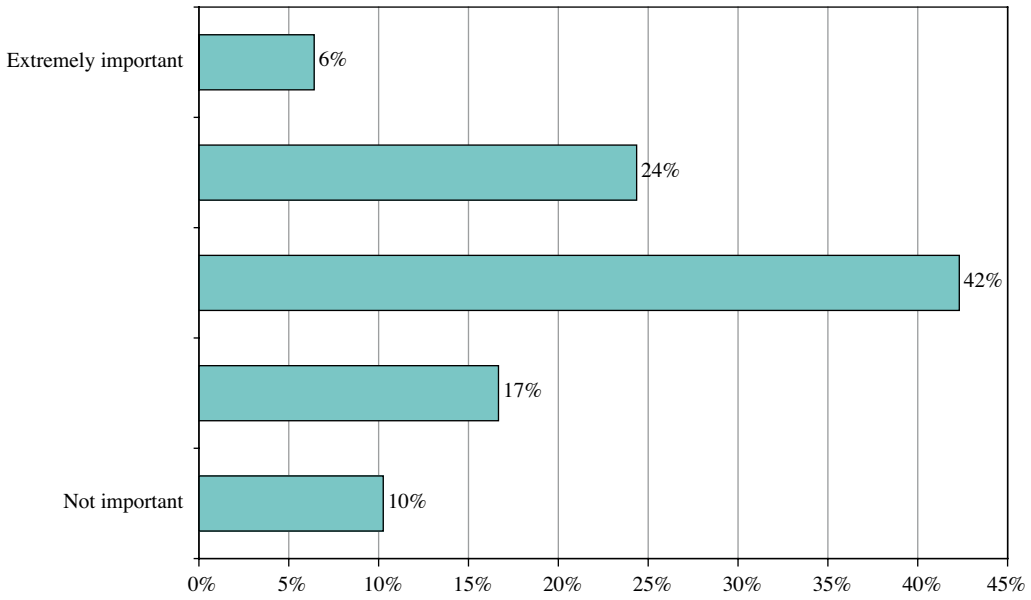
Figure AQ17 Importance of the last article presenting access difficulties on a scale of 1 to 5



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q18 In relation to the last article you had difficulty accessing, what particular difficulties did you encounter?

The main difficulties encountered in relation to the last article respondents had difficulty accessing included: I found the article online, but had to pay to access the full text (37%), I searched online, but could not find the article (23%), and I was unsure how to find the article (21%). Approximately 53% of difficulties encountered related in some way to toll access barriers.

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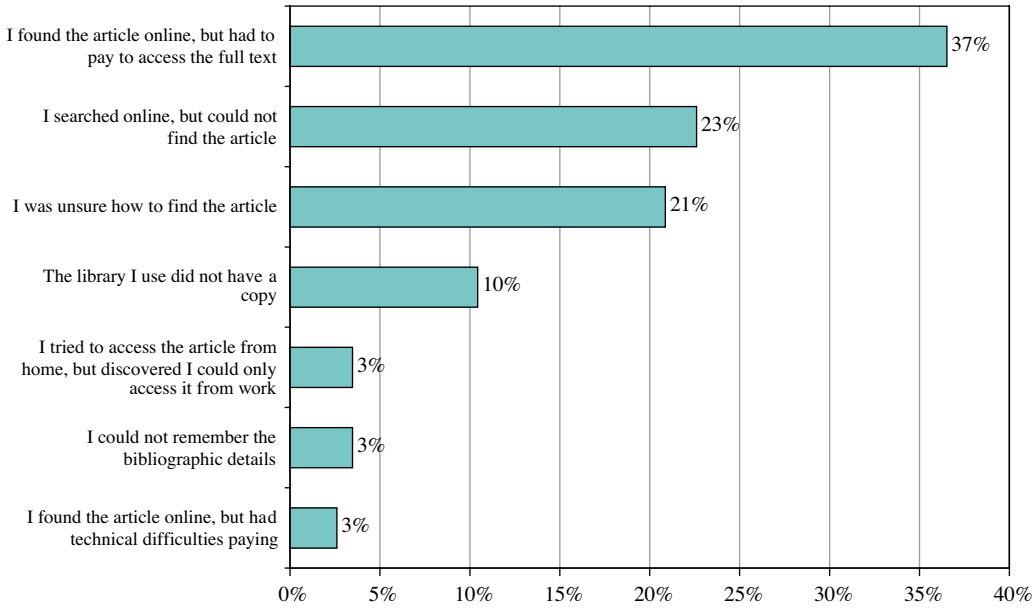
Figure AQ18 Access difficulties encountered



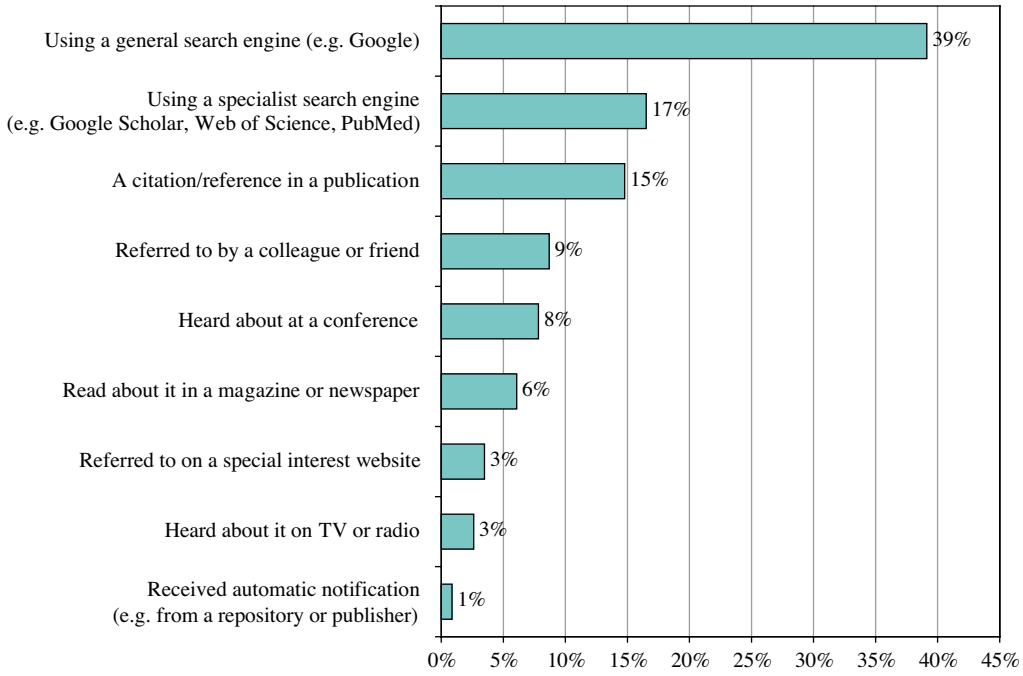
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q19 In relation to the last article you had difficulty accessing, how did you learn about it?

The main means of discovery of the last article respondents had difficulty accessing was through:

- The use of a general search engine (*e.g.* Google) (39%);
- Followed by using a specialist search engine (*e.g.* Google Scholar, Web of Science, PubMed) (17%);
- A citation/reference in a publication (15%); and
- Referred to it by a colleague or friend (9%).

Figure AQ19 Discovery of articles presenting access difficulties



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q20 In relation to the last article you had difficulty accessing, what did you do to obtain access to the FULL TEXT content of the article?

Asked what they did to obtain the last article they had difficulty accessing, respondents reported that they: obtained access using a web search engine (*e.g.* Google, Yahoo) (26%), looked for the article on the publisher's website (14%), obtained access via my organisation's library or in-house information service (11%), looked for the article on a conference website, obtained the article through someone who has access (*e.g.* an academic colleague) and obtained access via my local academic/research library (10%).

Other avenues reported by respondents included: bought it from an online bookshop, found the requested information elsewhere, and looked for another article. Four reported giving up, one saying they gave up because the article was too expensive.

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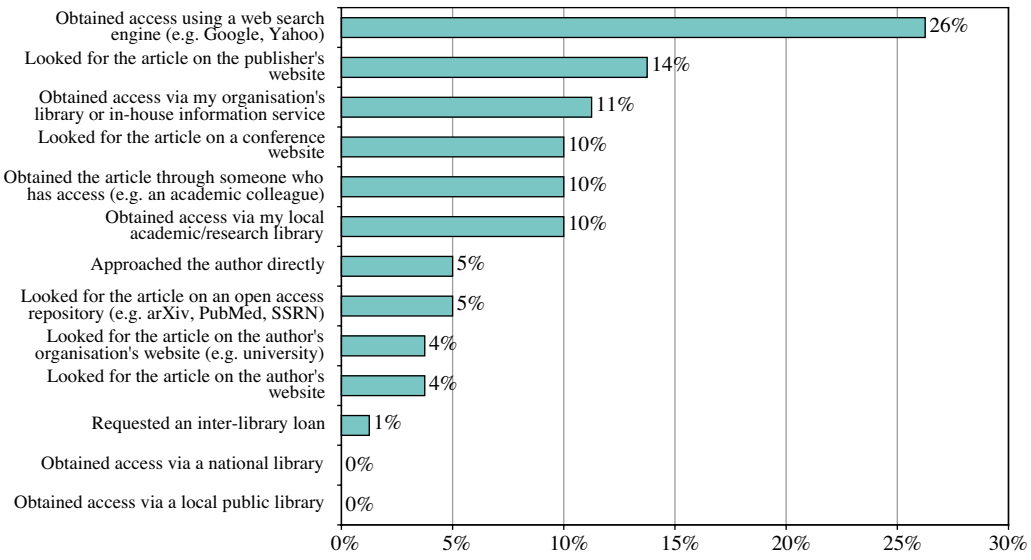
Figure AQ20 Access approaches used for articles presenting access difficulties



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

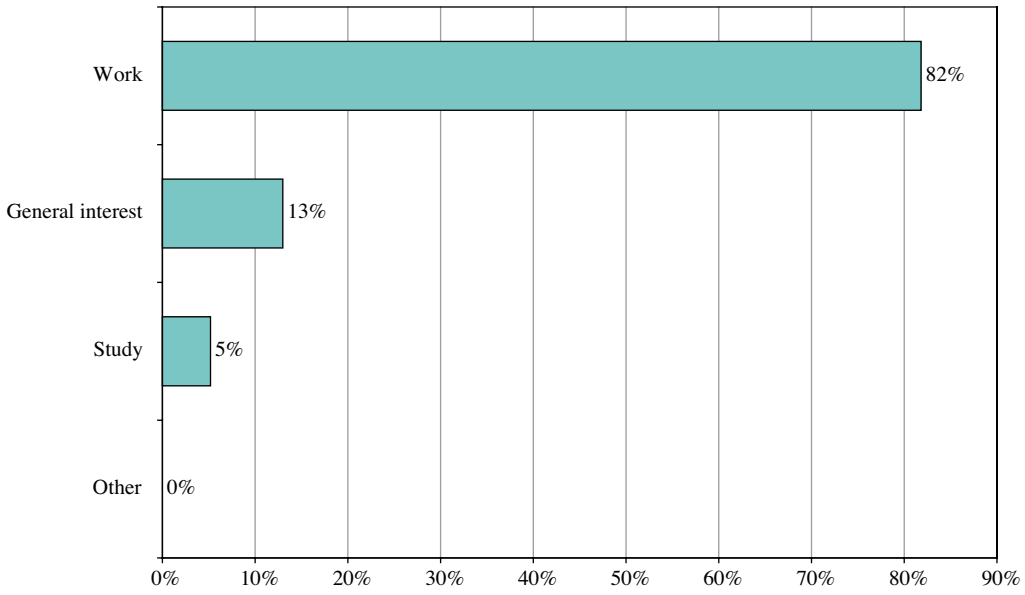
Q21 In relation to the last article you had difficulty accessing, approximately how much time did you spend trying to get access to it (whether successful or not)?

Asked how long they spent trying to access the last article they had difficulties accessing, responses ranged from 2 minutes to 5 hours and more. The average time was 51 minutes (N=67).

Q22 How did you intend to use the last article you had difficulty accessing?

The vast majority of respondents intended to use the last article they had difficulty accessing for work purposes (82%) (N=77).

Figure AQ22 Intended use of the last article presenting access difficulties



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q23 Is your experience with the last article you had difficulty accessing typical of the difficulties you have?

Twenty-nine of the 35 respondents (83%) commenting on the typicality of their experience with the last article presenting access difficulties said that the experience was typical. Most of the others responded with explanations as to why it was not possible to say whether typical or not, with just three (9%) saying it was not typical (*i.e.* answering "no").

Q24 If your firm has any CORPORATE SUBSCRIPTIONS to research journals, approximately how much does it pay each year in total?

Q25 If your firm has paid to access individual research articles (*e.g.* pay-per-view) in the past 12 months, approximately how much has it spent in total?

Q26 If you have any PERSONAL SUBSCRIPTIONS to research journals, approximately how much do you pay each year in total?

Q27 If you personally have paid to access individual research articles (*e.g.* pay-per-view) in the past 12 months, approximately how much have you spent in total?

Looking at expenditure on article access, respondents were asked about corporate and personal subscription and pay-per-view expenditures. Respondents report:

- Average corporate journal subscription spending of DKK 3 912 per year (N=64);
- Average corporate pay-per-view spending of DKK 1 578 per year (N=60);
- Average personal subscription spending of DKK 758 per year (N=62); and
- Average personal pay-per-view spending of DKK 296 per year (N=54).

The importance and value of access to academic research

Questions in this section were designed to help us understand how important access to research information is for the firms. We were interested in the extent to which the information found in research articles contributes to innovation and the value of that innovation to the firms. In particular, we wanted to know how important access to academic research is to the timeliness of product or service development and about delays or failures in product development that could be due to lack of access to academic research. We were interested in products and processes developed by the firms and/or developed externally and introduced by the firms (*i.e.* in the impacts on innovation, not simply on in-house research).

Questions were based on those originally used by Mansfield (1991; 1998) and refined through subsequent innovation surveys (OECD/EuroStat 2005). These questions are difficult to answer, especially for new start-up firms, and a number of respondents did not respond and/or commented on the difficulties they had in responding.

Q28 Has your firm developed or introduced any new or significantly improved products or processes during the last 3 years (whether new to your firm, new to the local market or new to the world)?

Seventy-two per cent reported introducing new or improved products or services during the last three years, 19% had introduced new or improved operational processes, and 8% had introduced new or improved organizational or managerial processes. Just 9% had not introduced innovations during the last three years (N=98).

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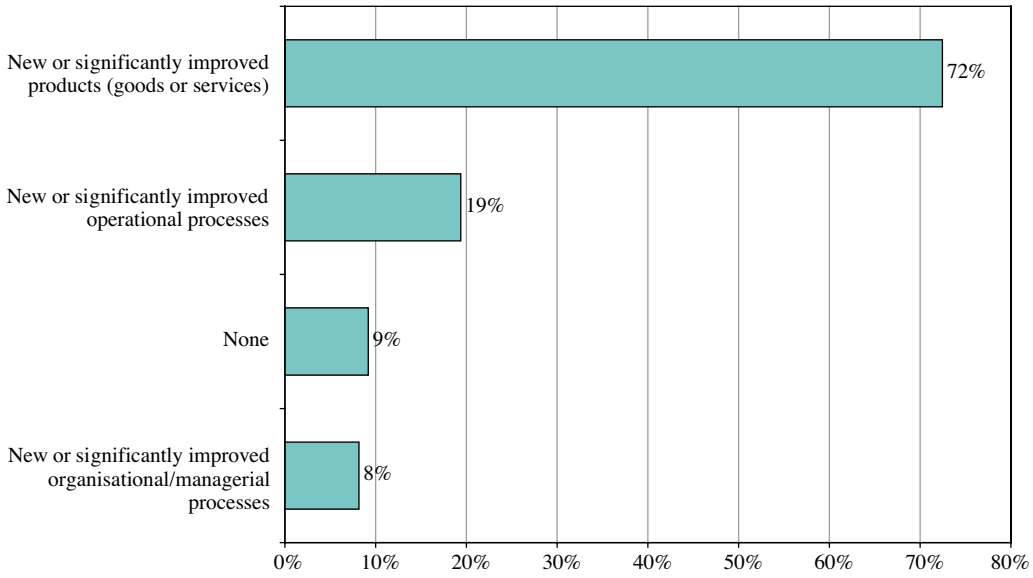
Figure AQ28 Introduction of new products, services and processes



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q29 Of the PRODUCTS developed or introduced in the last 3 years, approximately what percentage of them would have been delayed or abandoned if access to academic research had not been possible?

Respondent suggested that an average of 27% of the products developed or introduced during the last three years would have been delayed or abandoned without access to academic research (N=62). Comments included:

- Articles are used to establish the foundation and understand development issue.
- It is impossible to conduct hi-tech research without access to academic papers.
- We would still have developed the product, but with greater difficulties.
- We are not bothered by lack of access to articles or research. We develop, but not at such an advanced level.

The latter is interesting, as it suggests the potential to move to a higher level of knowledge-intensity were access to academic research would be more important.

Q31 Approximately, what contribution to sales do PRODUCTS developed or introduced in the last 3 years make (or what contribution will they make once introduced)?

Respondents said that products developed or introduced in the last three years had contributed or would contribute around 46% of sales (N=74).

Q32 Of the PROCESSES developed or introduced in the last 3 years, approximately what percentage of them would have been delayed or abandoned if access to academic research had not been possible?

An average of 19% of the processes developed or introduced over the last three years would have been delayed or abandoned without access to academic research (N=60). Comments included: the access to information is an important complement, when you wish to prove and include all benefits that new inventions would provide to the customers.

Q34 Approximately, what is the value of cost savings that PROCESSES developed or introduced in the last 3 years have enabled (or what savings will they enable once introduced)?

The estimated average value of cost savings from processes developed or introduced over the last three years was DKK 490 000 per year (N=48).

Q35 Approximately, what was the average time lag (in years) between the academic research and the first introduction of these new products and new processes?

Respondents reported an estimated average time lag between academic research and the first introduction of new products or processes at 2.8 years (N=59).

Q36 In your opinion, approximately how much longer might it have taken to develop or introduce these new products and processes without the contributing academic research?

Respondents suggested that it would have taken an average of 2.2 years longer to develop or introduce the new products or processes in the absence of contributing academic research (N=50).

There were a total of 39 researcher responses, although not all answered all the questions and some questions sought multiple responses and it is the share of total responses that is reported. Hence, wherever the presentation deviates from N=39 it is noted.

Demographics

The survey began with questions about the respondents and their firms.

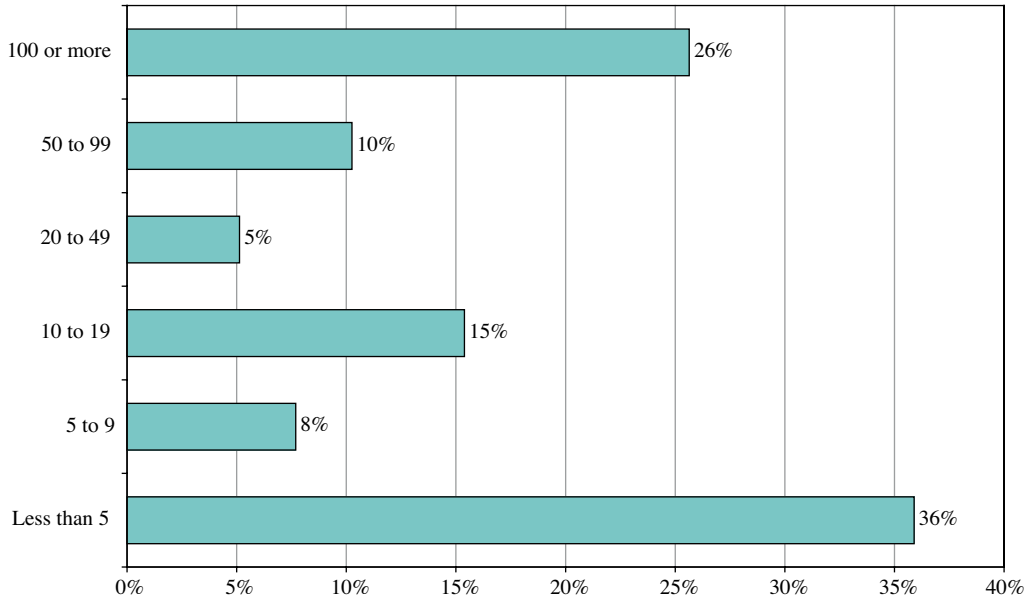
Q2 Are you or have you ever been involved with the national scheme of innovative incubators "Innovationsmiljoerne"?

Incubator firms accounted for 43% (15 firms) of those employing researcher respondents (N=35).

Q3 Approximately, how many employees are there in your firm?

The researchers' firms were typically small, with 36% (14 firms) reporting less than 5 employees and a further 8% less than 10 employees – although 26% (10 firms) reported employing 100 or more people (N=39).

Figure RQ3 Size of researchers' firms (number of employees)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q4 Approximately, what is your firm's annual revenue from SALES (on average over the last 3 years)?

Reported annual sales revenues varied, with a number of start-up firms not yet making sales and reporting zero sales revenue and others reporting sales revenue in excess of DKK 100 million per year. The average for researchers' firms was around DKK 153 million per year (N=35).

Q5 Approximately, what is your firm's annual R&D spending (on average over the last 3 years)?

Reported R&D spending also varied. A number of early stage firms reported R&D spending greater than sales and a small number of start-up firms reported R&D spending in the millions and zero revenue. Among researcher respondents, the firms reported average annual R&D spending of DKK 11.2 million on sales of DKK 153 million, or 7.4% (N=31).

Q6 Which best describes the main activity of your firm?

Seventy-four per cent (28 firms) described their activities as manufacturing, 11% (4 firms) as services and 16% (6 firms) as software/content (N=38).

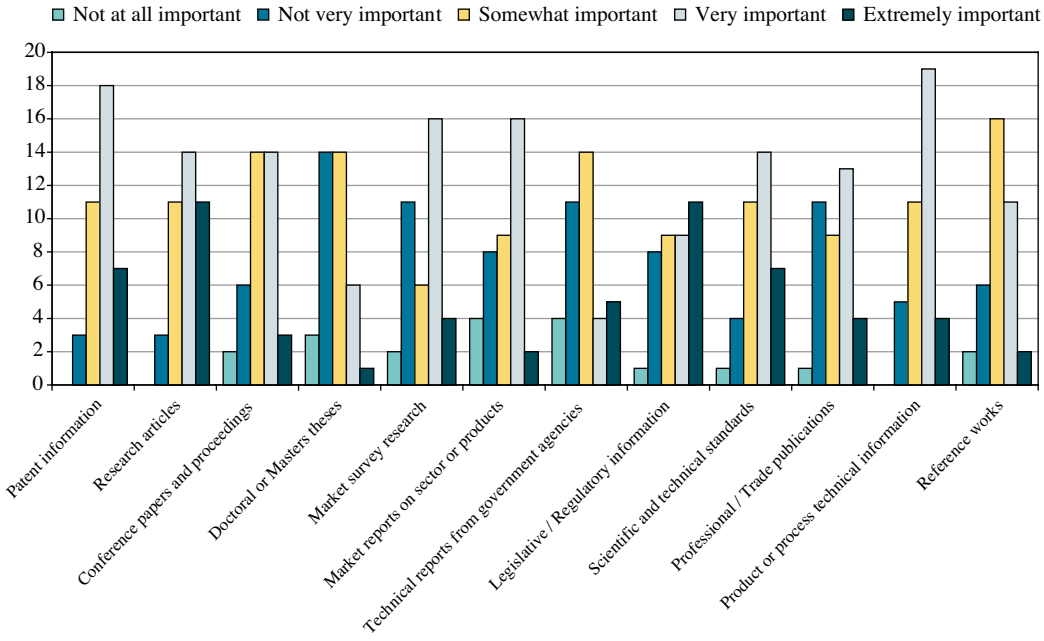
Information needs, access levels and costs

The second section of the questionnaire explored the respondents' information needs, how they discover and access information, and whether there are any barriers to access or gaps in what is available to them.

Q9 How important is it that you have access to the types of information listed below?
(On a scale of "not at all important" to "extremely important")

Figure RQ9 shows the researcher respondents' rankings of the importance of various information types (N=39).

Figure RQ9 Importance of each information type



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Asked to rank the importance of various types of information on a scale from 1 (not at all important) to 5 (extremely important) research respondents' ranked research articles highest (average score 3.8), followed by patent information (average score 3.7), and scientific and technical standards, product or process technical information and legislative/regulatory information (average score 3.6). Research respondents rated the importance of access to information more highly than others (*i.e.* reported higher average scores).

A higher 64% of research respondents rated research articles and patent information as very or extremely important, 59% product or process technical information, 54% scientific and technical standards, and 51% legislative/regulatory information and market survey research.

Figure RQ9a Average importance rating on a scale of 1 (not at all important) to 5 (extremely important)

Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

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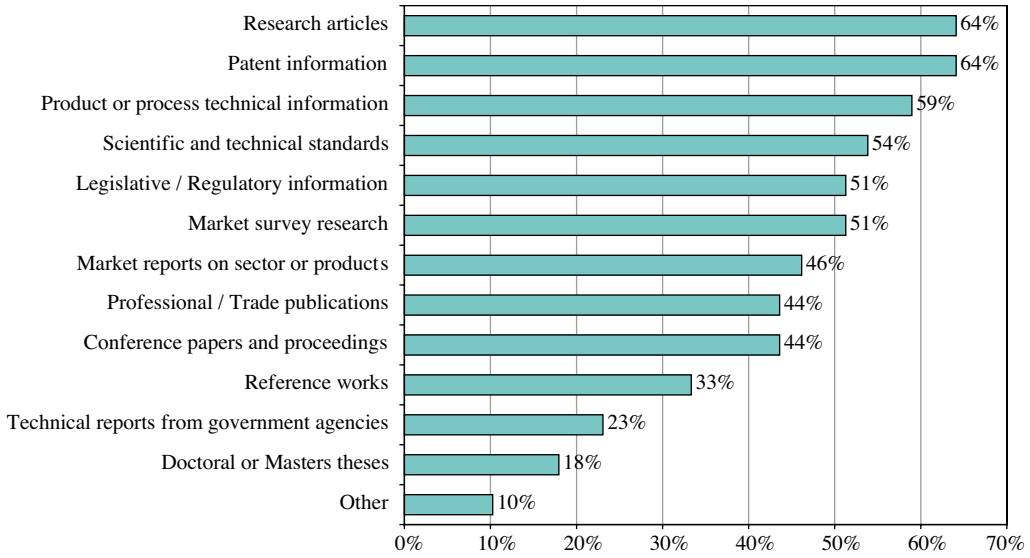
Figure RQ9b Percentage of researchers rating information type as very or extremely important

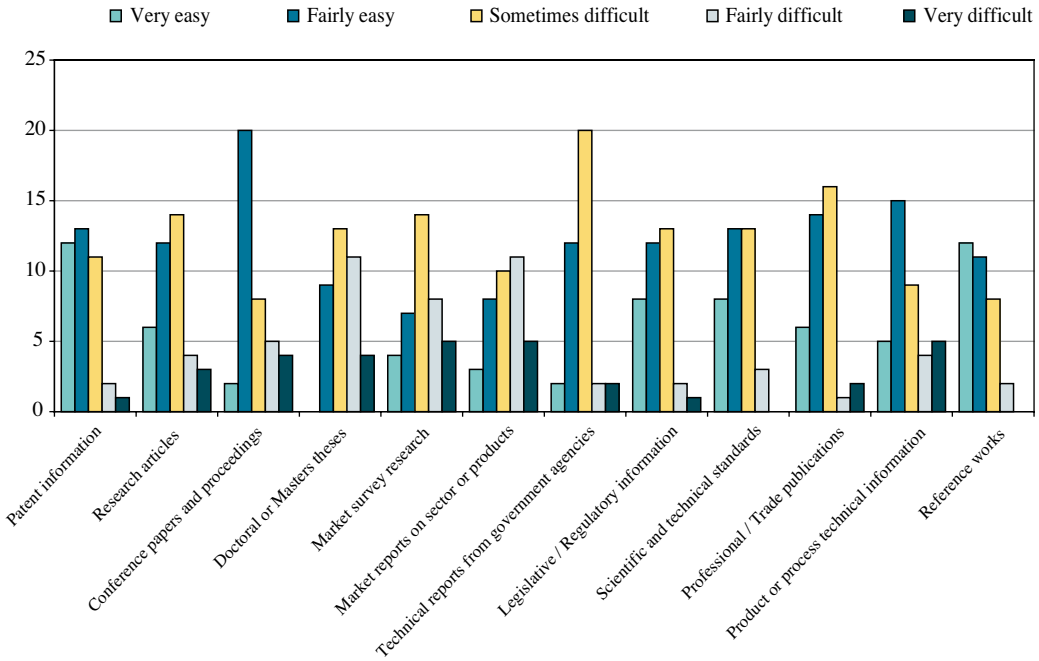


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q10 How easy is it for you to gain access to the FULL TEXT content of the information you need?
(On a scale of "very easy" to access the full text content to "very difficult")

Asked how easy it was for them to gain 'full text' access to these various types of information it was clear that many industry researchers experience some access difficulties.

Figure RQ10 Ease of access to each information type

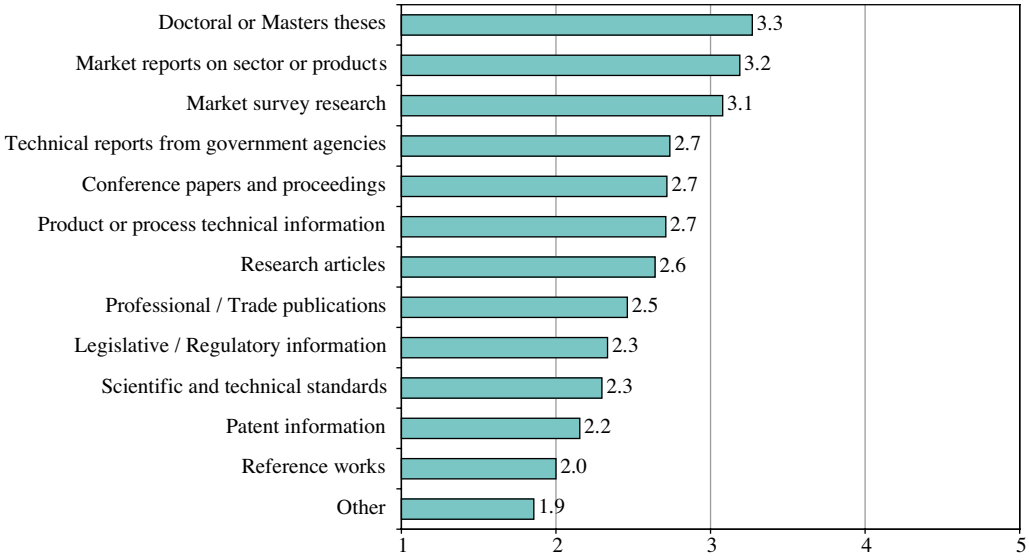


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Asked to rate the ease of gaining access to the 'full text' of various types of information on a scale from 1 (very easy) to 5 (very difficult) research respondents' rated Doctoral and Masters theses (average score 3.3), market reports on sector or products (average 3.2) and market survey research (average 3.1) the most difficult of the information types to access in full.

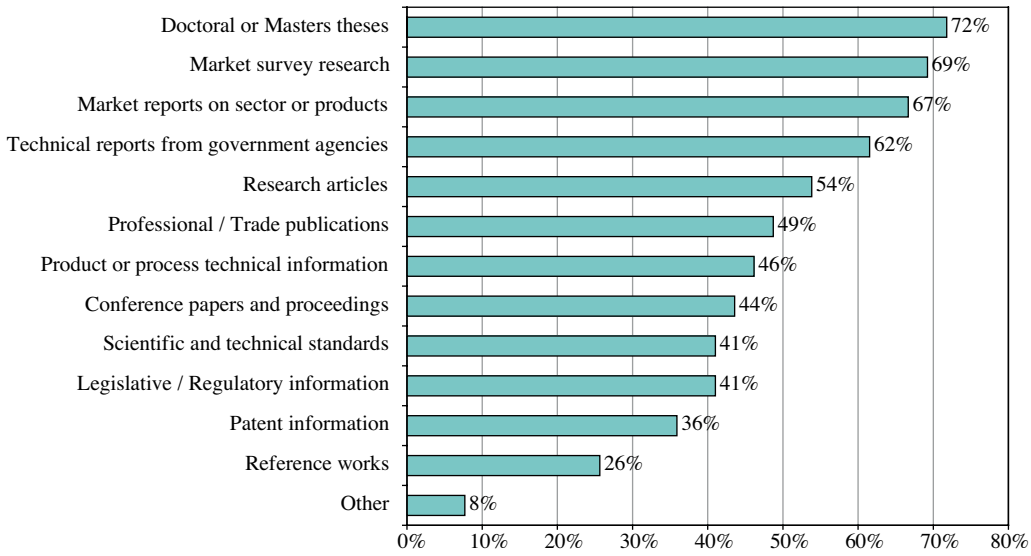
More than two-thirds of respondents reported having difficulties accessing market reports on sector or products, market survey research and Doctoral or Masters theses, 62% reported difficulties accessing technical reports from government agencies, and 54% reported difficulties accessing research articles.

Figure RQ10a Average access difficulty rating on a scale of 1 (very easy) to 5 (very difficult)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure RQ10b Percentage of researchers for who access is very, fairly or sometimes difficult

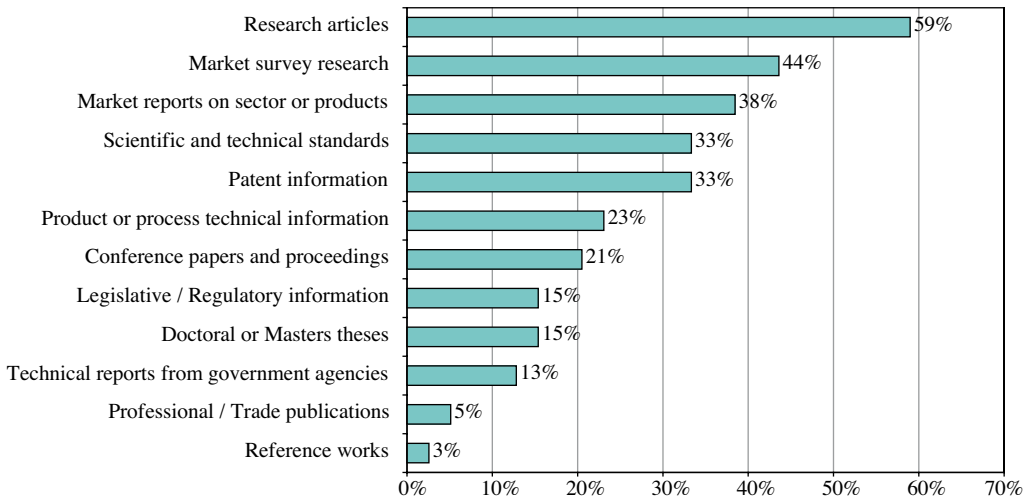


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q11 If you could improve access to any of these types of information, which would you choose?

To further explore their access needs and priorities, research respondents were asked which of the information types they would like to have improved access to. Fifty-nine per cent sought better access to research articles, substantially more than any other information type, with 44% seeking improved access to market survey research, and 38% to market reports on sector or products.

Figure RQ11a Percentage of research respondents wanting improved access by information type



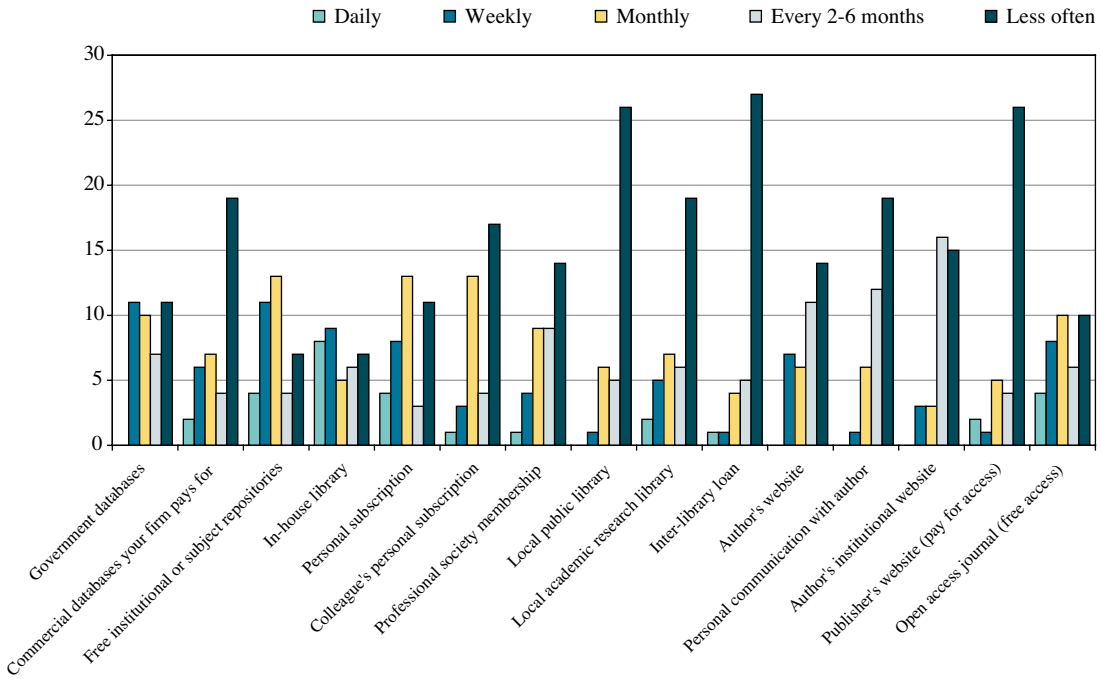
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q12 How often do you use the following ways to access the FULL TEXT content of the information you need?

Turning to search and discovery and frequency of access and use, research respondents were asked how frequently they used various means of access to the information they need. In-house libraries were the most commonly used access means, followed by free institutional or subject repositories, personal subscriptions and open access journals. The least frequently used methods include inter-library loan and local public library.

More than 70% of respondents reported using free institutional or subject repositories monthly or more frequently, 64% personal subscriptions, and 56% open access journal (free access) and in-house library. Inter-library loans and author's institutional website were the least used.

Figure RQ12 Frequency of access by access methods



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

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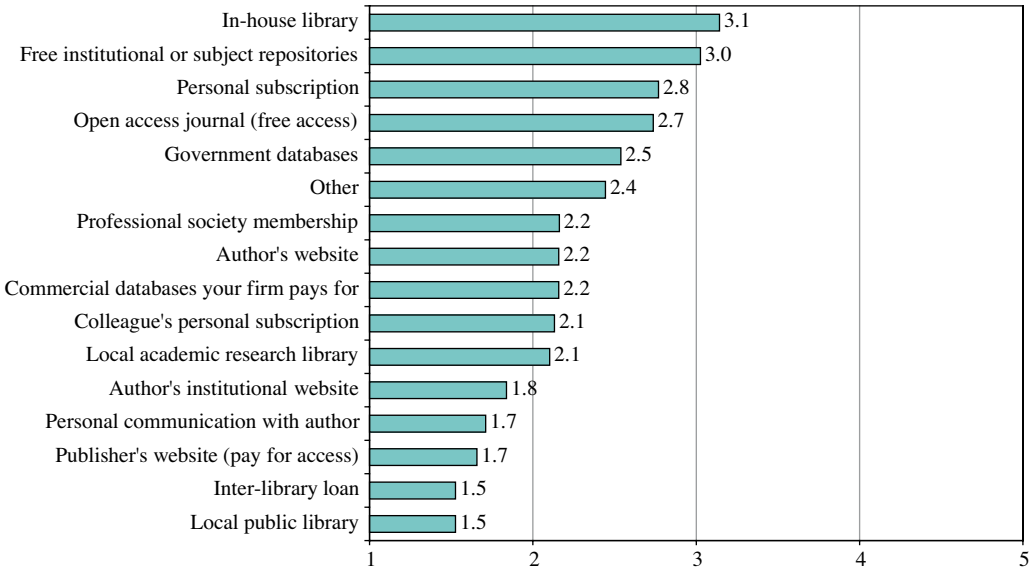
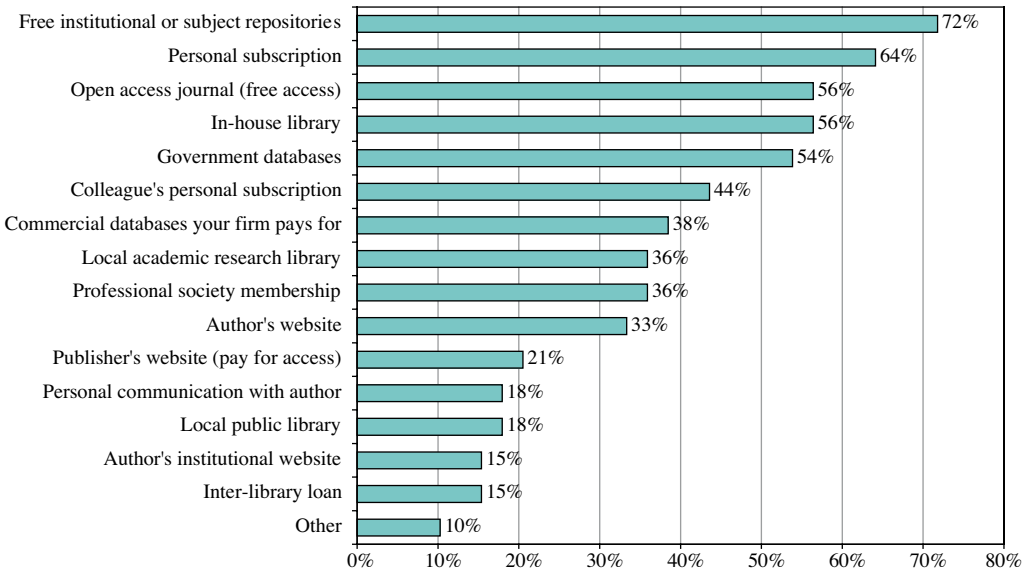
Figure RQ12a Average frequency of access by method on a scale of 1 (less often than every 2-6 months) to 5 (daily)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure RQ12b Percentage of research respondents using these access methods on a monthly basis or more frequently



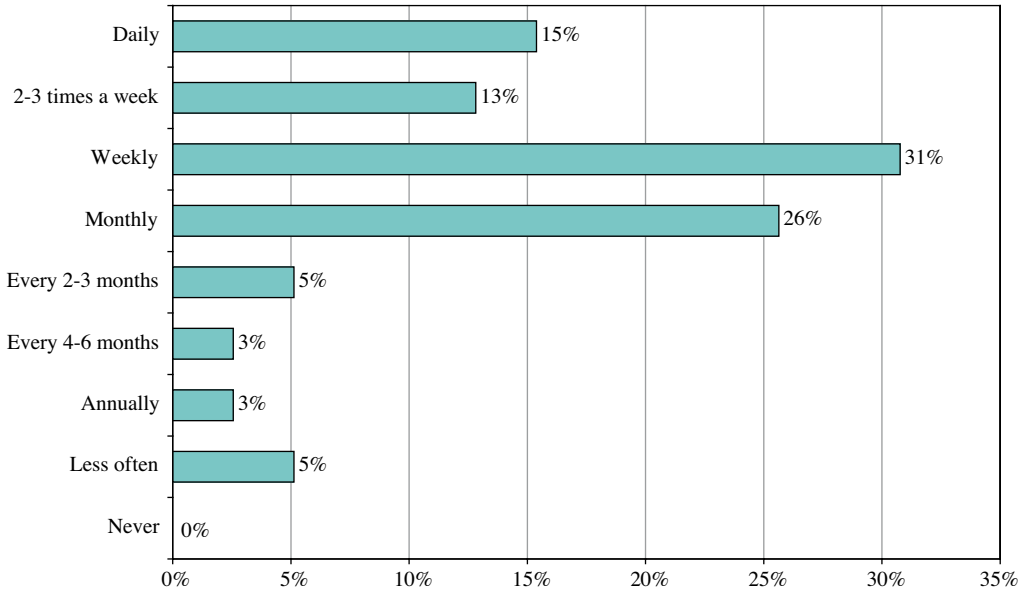
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q13 Approximately, how often do you read or consult research articles, either in journals or individually, and in either print or electronic form?

Looking specifically at access and use of research articles, research respondents were asked how often they read or consulted research articles, either in journals or individually, and in either print or electronic form.

Reflecting their research roles, no less than 85% of research respondents reported reading or consulting research articles on a monthly or more regular basis, 59% on a weekly or more regular basis and 15% on a daily basis (N=39).

Figure RQ13 Frequency of reading or consulting research articles



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

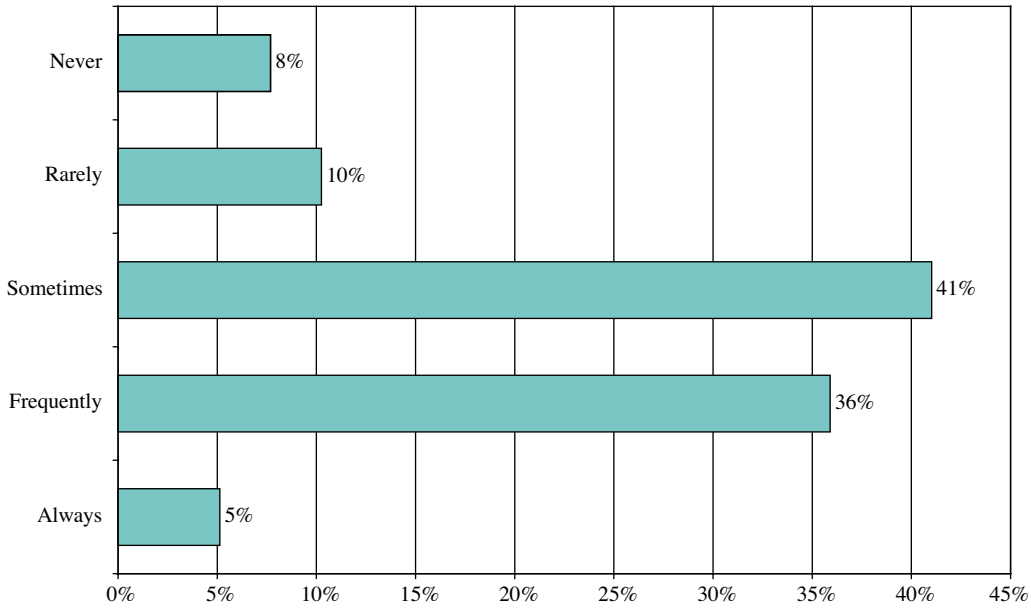
Q14 Approximately, how many research articles do you read or consult each year, either in print or electronic form?

Asked how many research articles they read or consult each year, research respondents reported an average 73 articles per year (N=35).

Q15 Do you have any difficulty accessing the FULL TEXT of the research articles you need?

Asked about the frequency of access difficulties relating to research articles, 41% of research respondents said they always or frequently had difficulty getting the research articles they needed, and a further 41% said they sometimes had difficulties. Just 3 reported that they never experienced access difficulties (N=39).

Figure RQ15 Frequency of access difficulty relating to research articles



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q16 During the past 12 months, approximately how many research articles did you find it difficult to access?

The number of research articles research respondents had difficulty accessing during the last year varied, with the average being 17 articles presenting difficulties during the last year (N=28).

Given that they report reading an average of 73 per year, access difficulties were equivalent to 23% of readings (including open access article readings).

Q17 In relation to the LAST RESEARCH ARTICLE YOU HAD DIFFICULTY ACCESSING, how important was it to gain access to the full text of the article? ***(On a scale of 1 "not at all important" to 5 "extremely important")***

Research respondents attached importance to the articles they had difficulties accessing.

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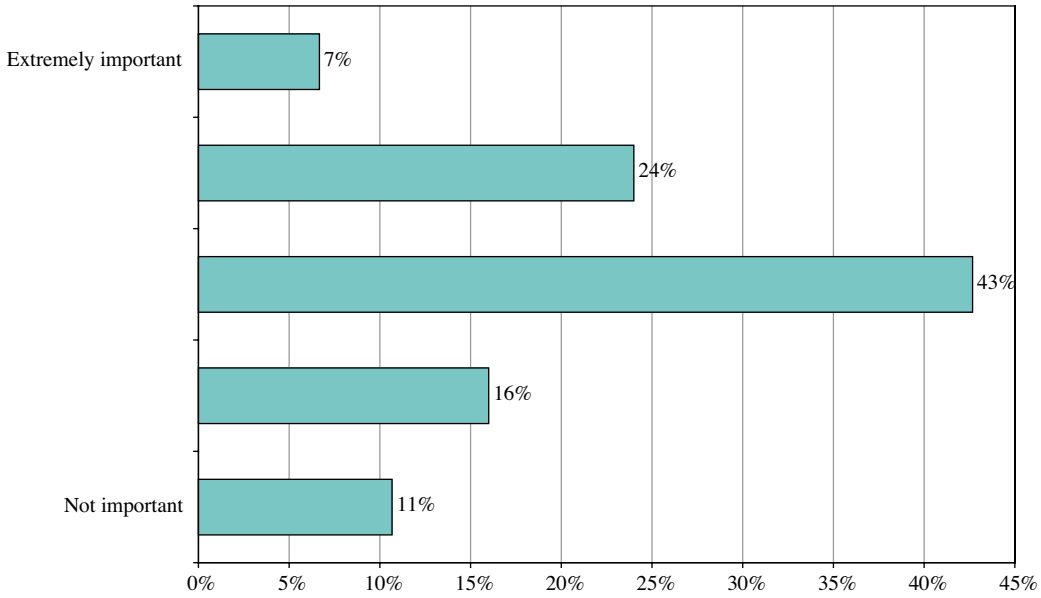
Figure RQ17 Importance of the last article presenting access difficulties on a scale of 1 to 5



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q18 In relation to the last article you had difficulty accessing, what particular difficulties did you encounter?

The main difficulties encountered in relation to the last article that research respondents had difficulty accessing included: I found the article online, but had to pay to access the full text (41%), I searched online, but could not find the article (22%), and the library I use did not have a copy and I was unsure how to find the article (11%). Approximately 64% of difficulties encountered related in some way to toll access barriers.

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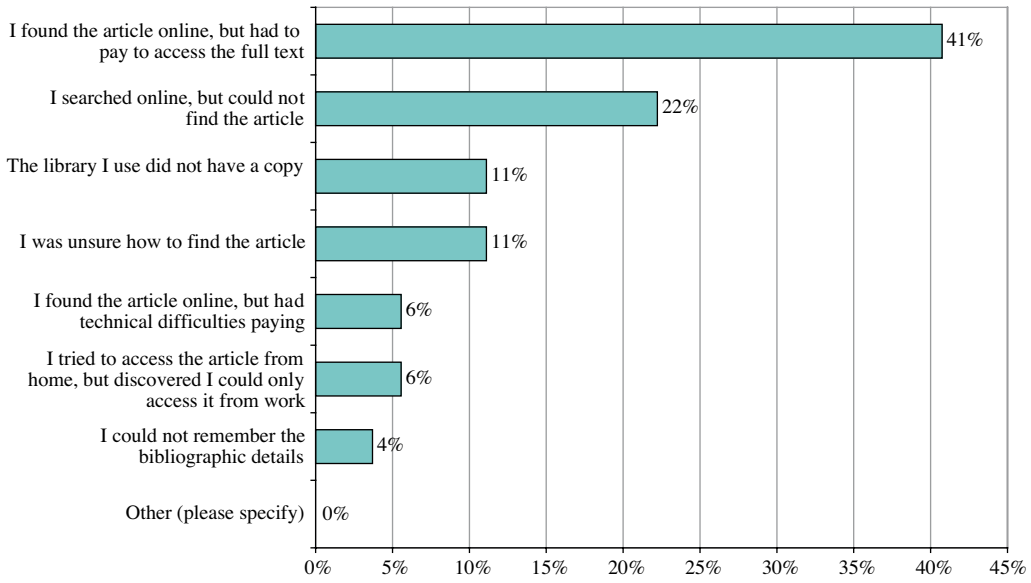
Figure RQ18 Access difficulties encountered by researcher respondents

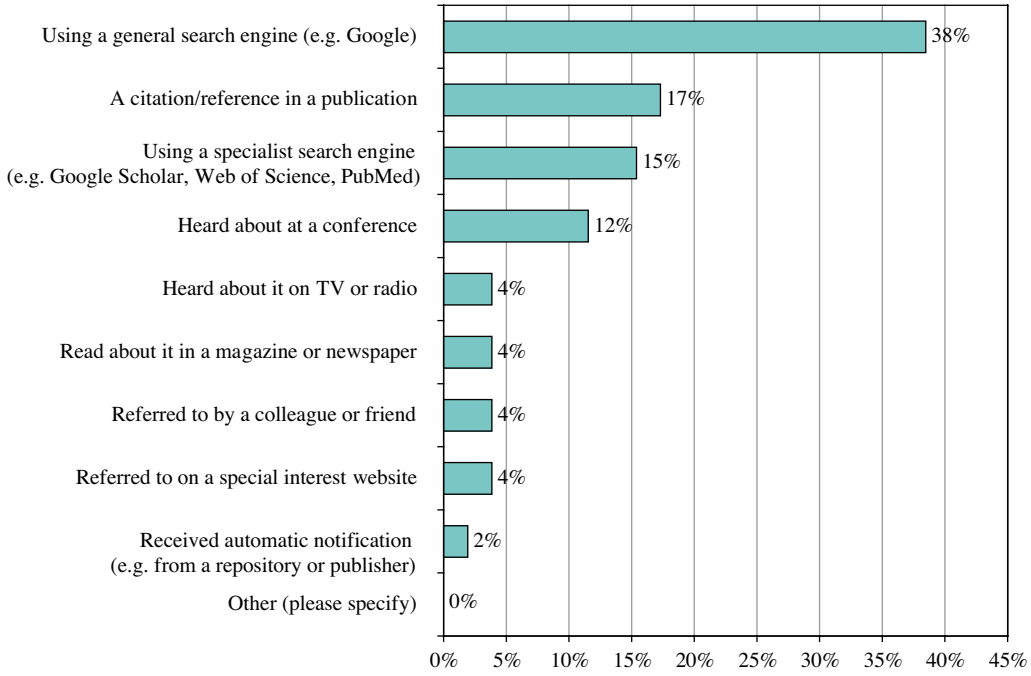


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q19 In relation to the last article you had difficulty accessing, how did you learn about it?

The main means of discovery of the last article research respondents had difficulty accessing was through the use of a general search engine (*e.g.* Google) (38%), followed by a citation/reference in a publication (17%) and using a specialist search engine (*e.g.* Google Scholar, Web of Science, PubMed) (15%).

Figure RQ19 Discovery of articles presenting access difficulties

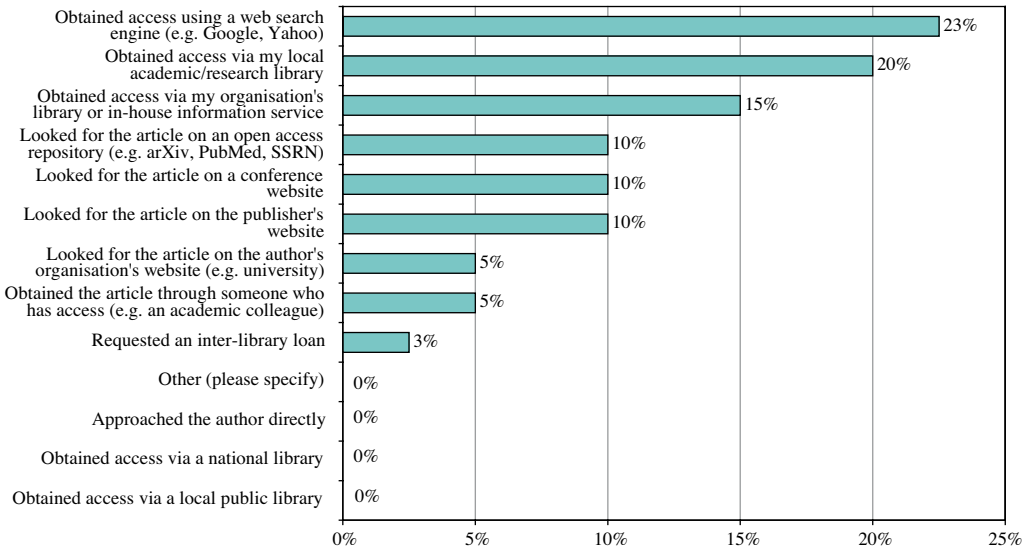


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q20 In relation to the last article you had difficulty accessing, what did you do to obtain access to the FULL TEXT content of the article?

Asked what they did to obtain the last article they had difficulty accessing, research respondents reported that they: obtained access using a web search engine (*e.g.* Google, Yahoo) (23%), obtained access via my local academic/research library (20%), and obtained access via my organisation's library or in-house information service (15%). Few used inter-library loan or public libraries.

Figure RQ20 Access approaches used for articles presenting access difficulties



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

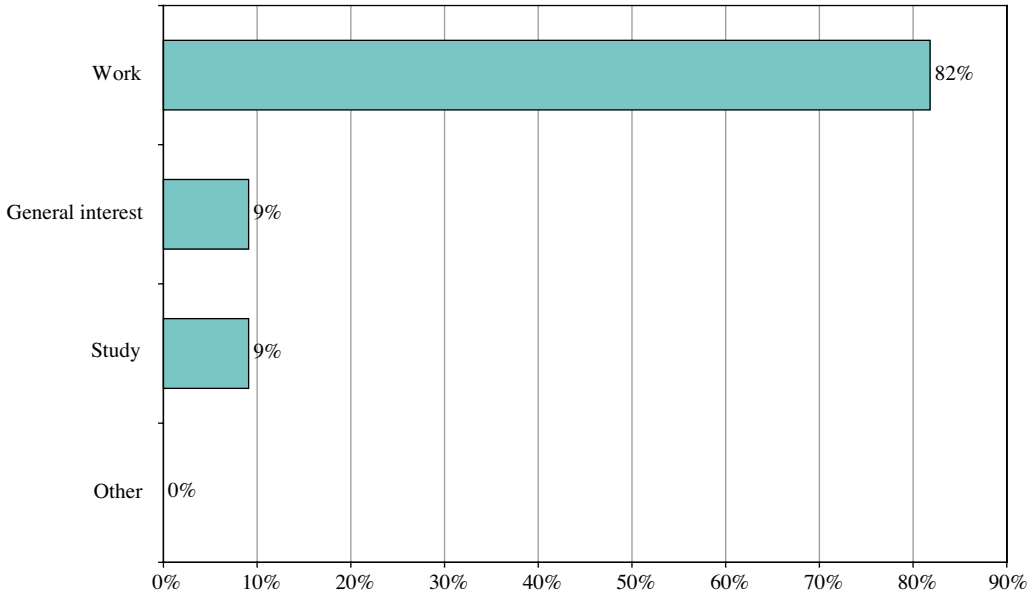
Q21 In relation to the last article you had difficulty accessing, approximately how much time did you spend trying to get access to it (whether successful or not)?

Asked how long they spent trying to access the last article they had difficulties accessing, researcher responses ranged from 2 minutes to 10 hours. The average time was 63 minutes (N=28).

Q22 How did you intend to use the last article you had difficulty accessing?

The vast majority of research respondents intended to use the last article they had difficulty accessing for work purposes (82%) (N=33).

Figure RQ22 Intended use of the last article presenting access difficulties



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q23 Is your experience with the last article you had difficulty accessing typical of the difficulties you have?

Sixteen of the 18 research respondents (89%) commenting on the typicality of their experience with the last article presenting access difficulties said that the experience was typical, with just two saying it was not typical (*i.e.* answering "no").

Q24 If your firm has any CORPORATE SUBSCRIPTIONS to research journals, approximately how much does it pay each year in total?

Q25 If your firm has paid to access individual research articles (*e.g.* pay-per-view) in the past 12 months, approximately how much has it spent in total?

Q26 If you have any PERSONAL SUBSCRIPTIONS to research journals, approximately how much do you pay each year in total?

Q27 If you personally have paid to access individual research articles (*e.g.* pay-per-view) in the past 12 months, approximately how much have you spent in total?

Looking at expenditure on article access, research respondents were asked about corporate and personal subscription and pay-per-view expenditures. Research respondents report:

- Average corporate journal subscription spending of DKK 2 224 per year (N=26);
- Average corporate pay-per-view spending of DKK 1 056 per year (N=23);

- Average personal subscription spending of DKK 839 per year (N=26); and
- Average personal pay-per-view spending of DKK 726 per year (N=19).

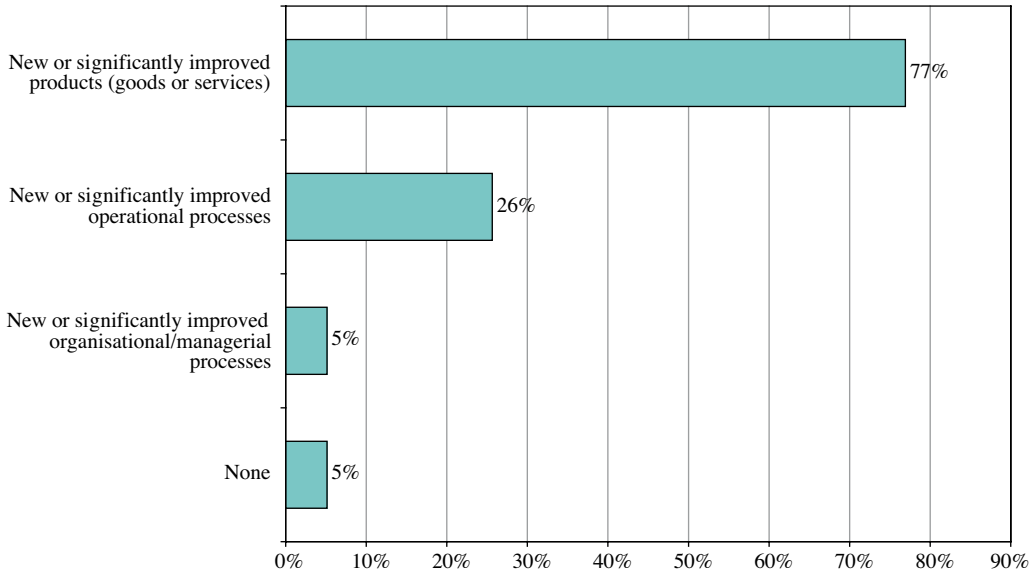
The importance and value of access to academic research

Questions in this section were designed to help us understand how important access to research information is for the firms. We were interested in the extent to which the information found in research articles contributes to innovation and the value of that innovation to the firms. In particular, we wanted to know how important access to academic research is to the timeliness of product or service development and about delays or failures in product development that could be due to lack of access to academic research. We were interested in products and processes developed by the firms and/or developed externally and introduced by the firms (*i.e.* in the impacts on innovation, not simply on in-house research).

Q28 Has your firm developed or introduced any new or significantly improved products or processes during the last 3 years (whether new to your firm, new to the local market or new to the world)?

Seventy-seven per cent reported introducing new or improved products or services during the last three years, 26% had introduced new or improved operational processes, and 5% had introduced new or improved organizational or managerial processes. Just 5% had not introduced innovations during the last three years (N=39).

Figure RQ28 Introduction of new products, services and processes



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q29 Of the PRODUCTS developed or introduced in the last 3 years, approximately what percentage of them would have been delayed or abandoned if access to academic research had not been possible?

Research respondent suggested that an average of 38% of the products developed or introduced during the last three years would have been delayed or abandoned without access to academic research (N=25).

Q31 Approximately, what contribution to sales do PRODUCTS developed or introduced in the last 3 years make (or what contribution will they make once introduced)?

Research respondents said that products developed or introduced in the last three years had contributed or would contribute around 55% of sales (N=28).

Q32 Of the PROCESSES developed or introduced in the last 3 years, approximately what percentage of them would have been delayed or abandoned if access to academic research had not been possible?

An average of 34% of the processes developed or introduced over the last three years would have been delayed or abandoned without access to academic research (N=24).

Q34 Approximately, what is the value of cost savings that PROCESSES developed or introduced in the last 3 years have enabled (or what savings will they enable once introduced)?

The estimated average value of cost savings from processes developed or introduced over the last three years was DKK 964 000 among research respondents (N=18).

Q35 Approximately, what was the average time lag (in years) between the academic research and the first introduction of these new products and new processes?

Respondents reported an estimated average time lag between academic research and the first introduction of new products or processes at 3.7 among the research respondents (N=21).

Q36 In your opinion, approximately how much longer might it have taken to develop or introduce these new products and processes without the contributing academic research?

Research respondents suggested that it would have taken an average of 3.4 years longer to develop or introduce the new products or processes in the absence of contributing academic research (N=19).

Incubator firms >

There were a total of 30 incubator firm responses, although not all answered all the questions and some questions sought multiple responses and it is the share of total responses that is reported. Hence, wherever the presentation deviates from N=30 it is noted.

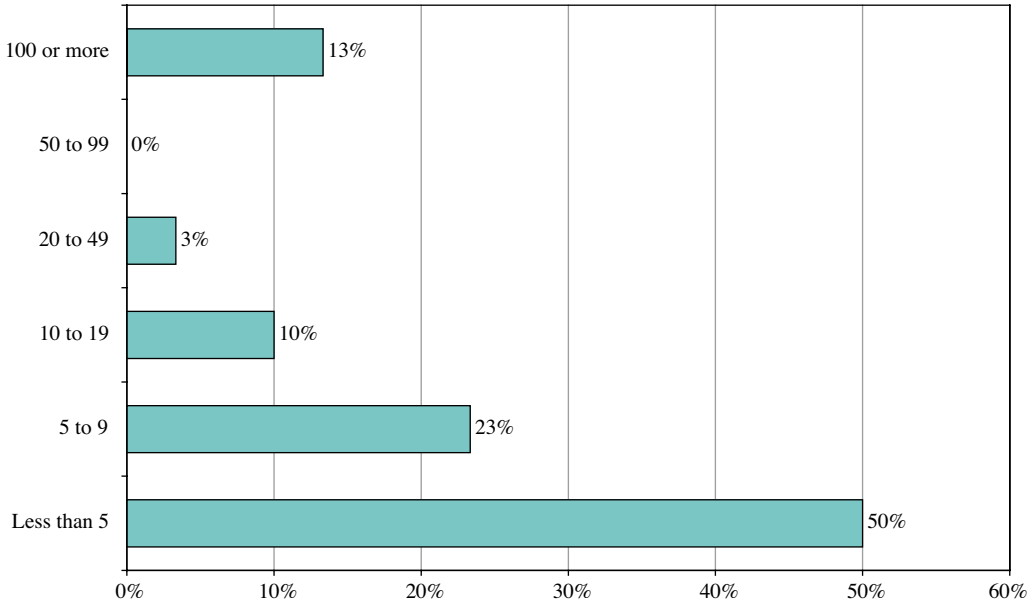
Demographics

The survey began with questions about the respondents and their firms.

Q3 Approximately, how many employees are there in your firm?

The incubator firms were typically small, with 50% (15 firms) reporting less than 5 employees, and a further 33% less than 20.

Figure IQ3 Size of incubator firms (number of employees)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q4 Approximately, what is your firm's annual revenue from SALES (on average over the last 3 years)?

Reported annual sales revenues varied, with the average among incubator firms being DKK 71 million per year.

Q5 Approximately, what is your firm's annual R&D spending (on average over the last 3 years)?

Reported R&D spending also varied, with the average annual R&D spending being DKK 7 million on sales of DKK 71 million, or 10%.

Q6 Which best describes the main activity of your firm?

Among incubator firms, 55% (16 firms) described their activities as manufacturing, 17% (5 firms) as services and 28% (8 firms) as software/content.

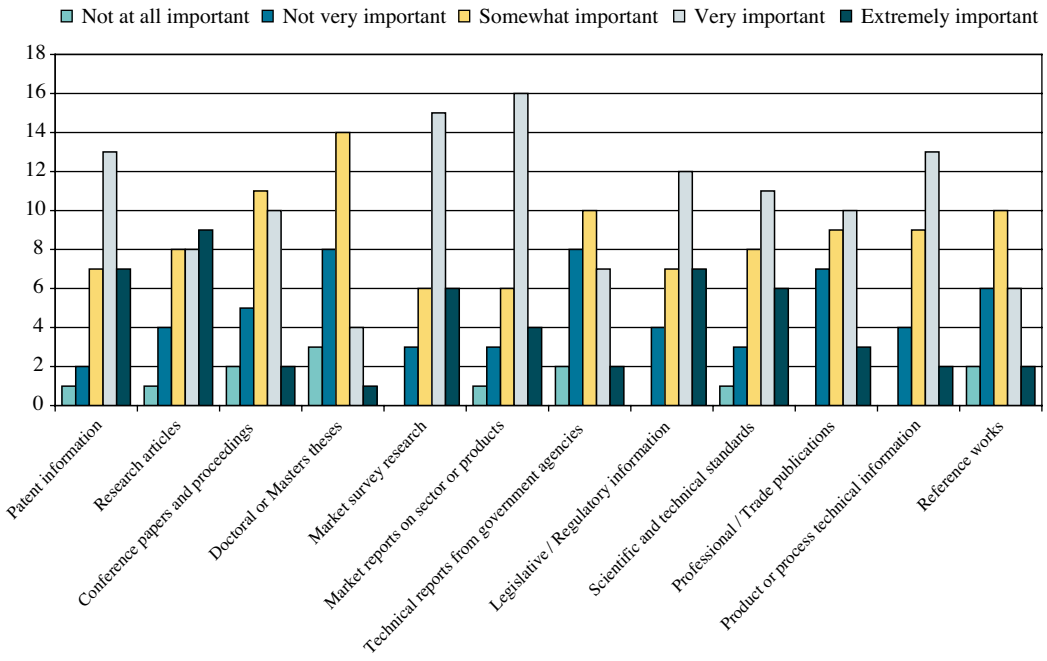
Information needs, access levels and costs

The second section of the questionnaire explored the respondents' information needs, how they discover and access information, and whether there are any barriers to access or gaps in what is available to them.

Q9 How important is it that you have access to the types of information listed below? ***(On a scale of "not at all important" to "extremely important")***

Figure IQ9 shows the incubator firm respondents' rankings of the importance of various information types (N=30).

Figure IQ9 Importance of each information type

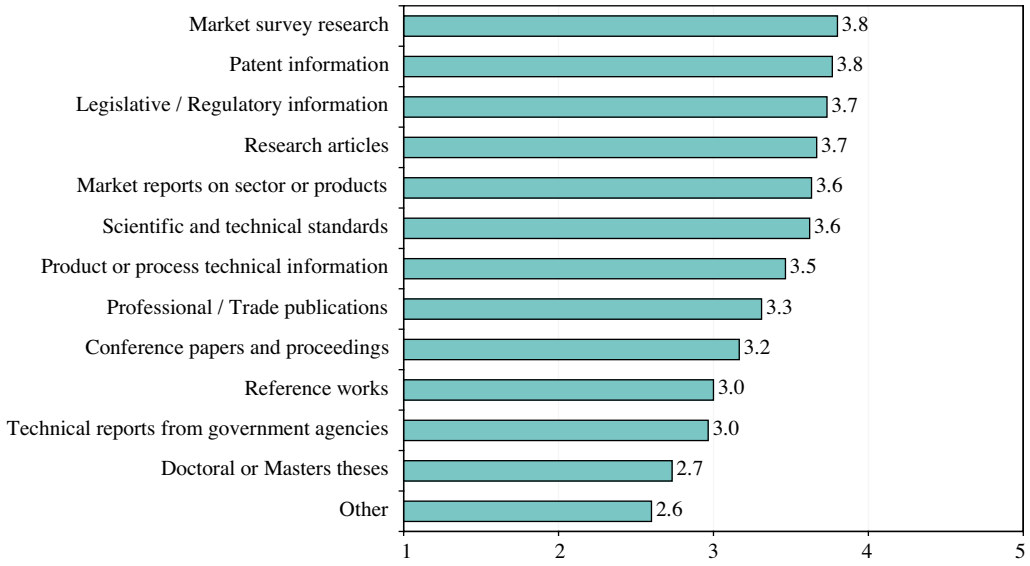


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Asked to rank the importance of various types of information on a scale from 1 (not at all important) to 5 (extremely important) incubator firm respondents' ranked market survey research and patent information highest (average score 3.8), followed by legislative/regulatory information and research articles (average score 3.7).

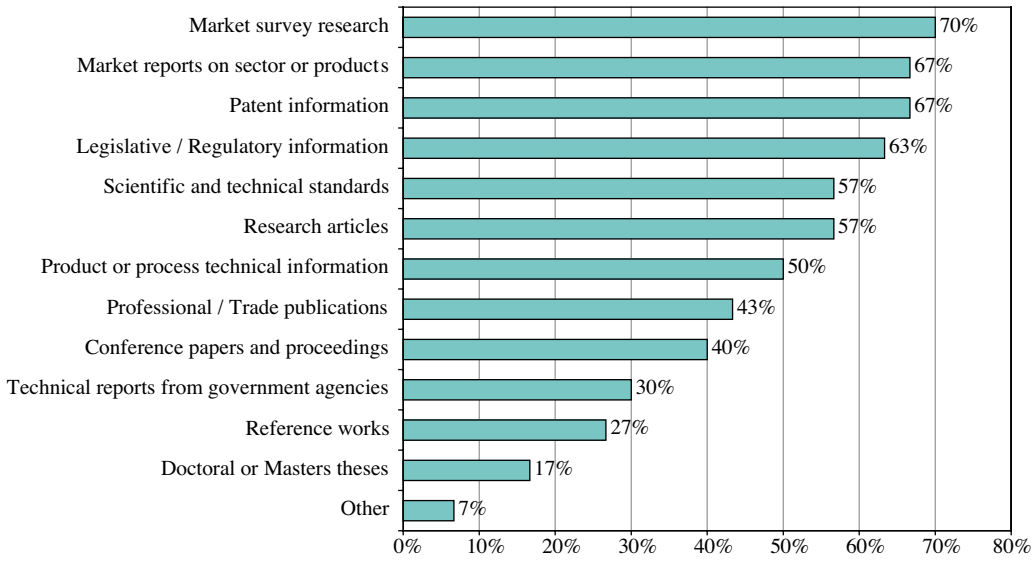
Seventy per cent of incubator respondents rated market survey research as very or extremely important, 67% market reports on sector or products and patent information, and 63% legislative/regulatory information.

Figure IQ9a Average importance rating on a scale of 1 (not at all important) to 5 (extremely important)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure IQ9b Percentage of incubator firm respondents rating information type as very or extremely important

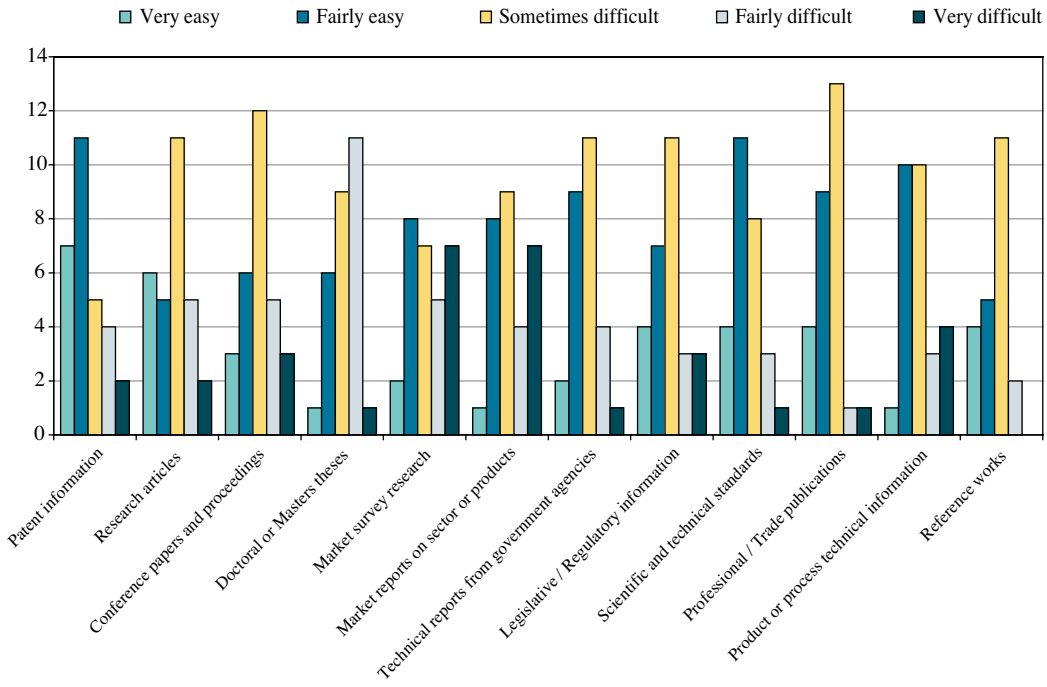


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q10 How easy is it for you to gain access to the FULL TEXT content of the information you need?
(On a scale of "very easy" to access the full text content to "very difficult")

Asked how easy it was for them to gain 'full text' access to these various types of information it was clear that many incubator firms experience some access difficulties.

Figure IQ10 Ease of access to each information type



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Asked to rate the ease of gaining access to the 'full text' of various types of information on a scale from 1 (very easy) to 5 (very difficult) incubator firm respondents' rated market reports on sector or products (average score 3.3), and market survey research and Doctoral and Masters theses (average 3.2) the most difficult of the information types to access in full.

More than two-thirds of respondents reported having difficulties accessing Doctoral or Masters theses, market reports on sector or products and conference papers and proceedings, and 60% reported difficulties accessing research articles.

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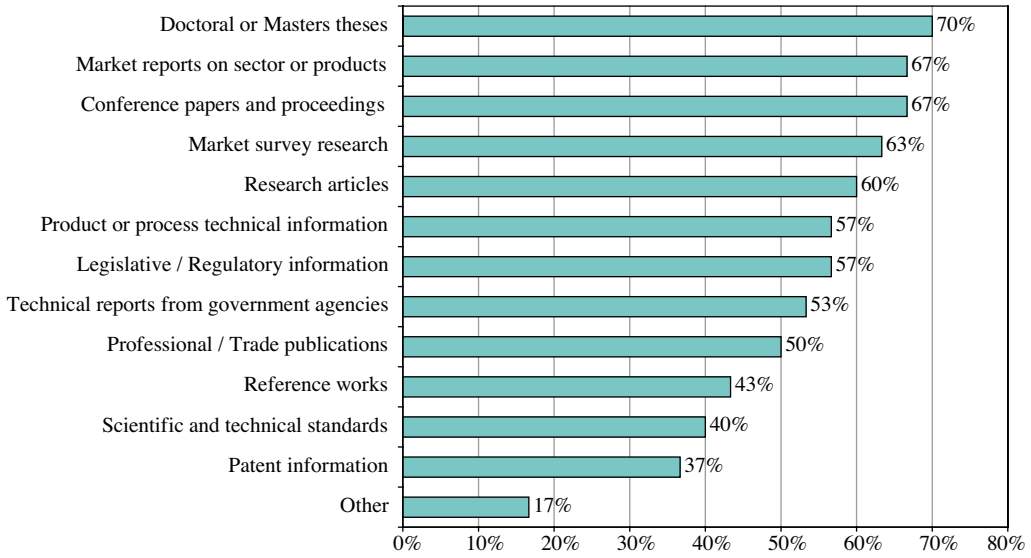
Figure IQ10a Average access difficulty rating on a scale of 1 (very easy) to 5 (very difficult)

Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure IQ10b Percentage of incubator firm respondents for who access is very, fairly or sometimes difficult

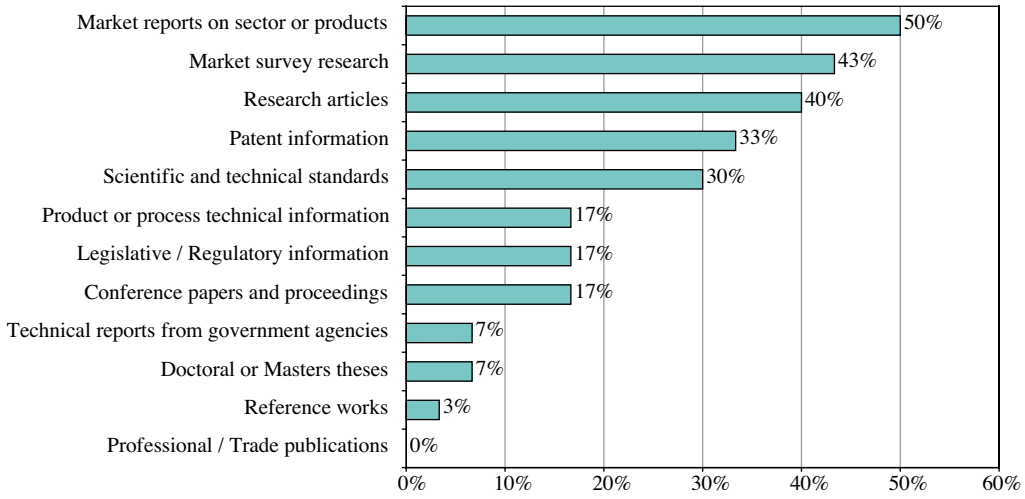


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q11 If you could improve access to any of these types of information, which would you choose?

To further explore their access needs and priorities, incubator respondents were asked which of the information types they would like to have improved access to. Fifty per cent sought better access to market reports on sector or products, with 43% seeking improved access to market survey research, and 40% to research articles.

Figure IQ11a Percentage of incubator firm respondents wanting improved access by information type



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q12 How often do you use the following ways to access the FULL TEXT content of the information you need?

Turning to search and discovery and frequency of access and use, incubator firm respondents were asked how frequently they used various means of access to the information they need. Free institutional or subject repositories and open access journals, in-house libraries and personal subscriptions were the most commonly used access means. The least frequently used methods include inter-library loan, publishers' websites (*e.g.* pay-per-view) and local public libraries.

More than 70% of respondents reported using free institutional or subject repositories monthly or more frequently, 67% open access journal (free access), 60% personal subscriptions and 53% and in-house library. Inter-library loans and personal communication with the author were the least used.

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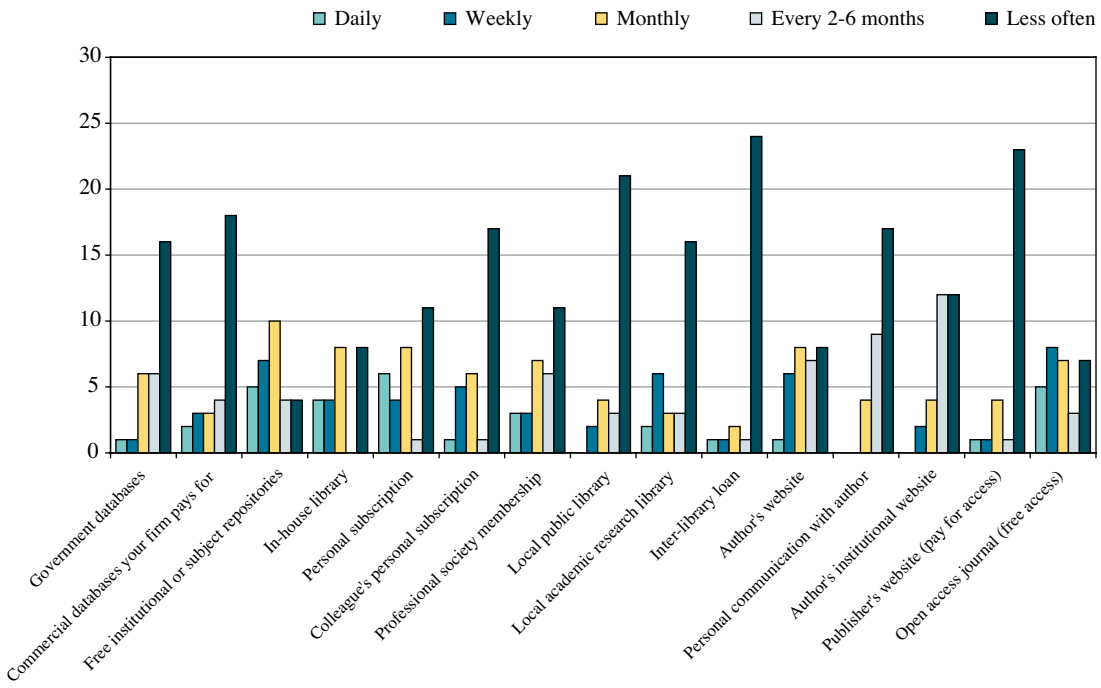
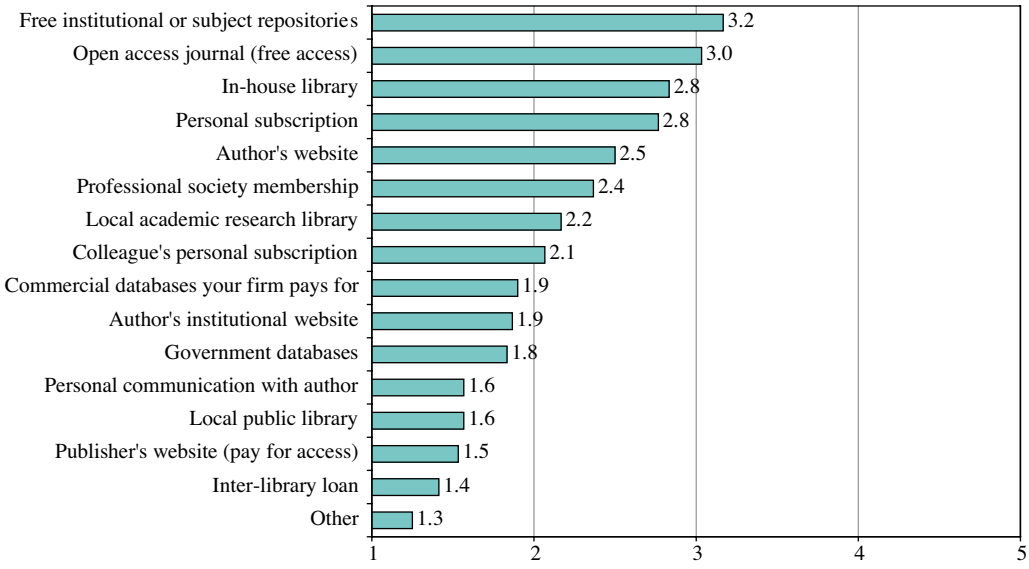
Figure IQ12 Frequency of access by access methods



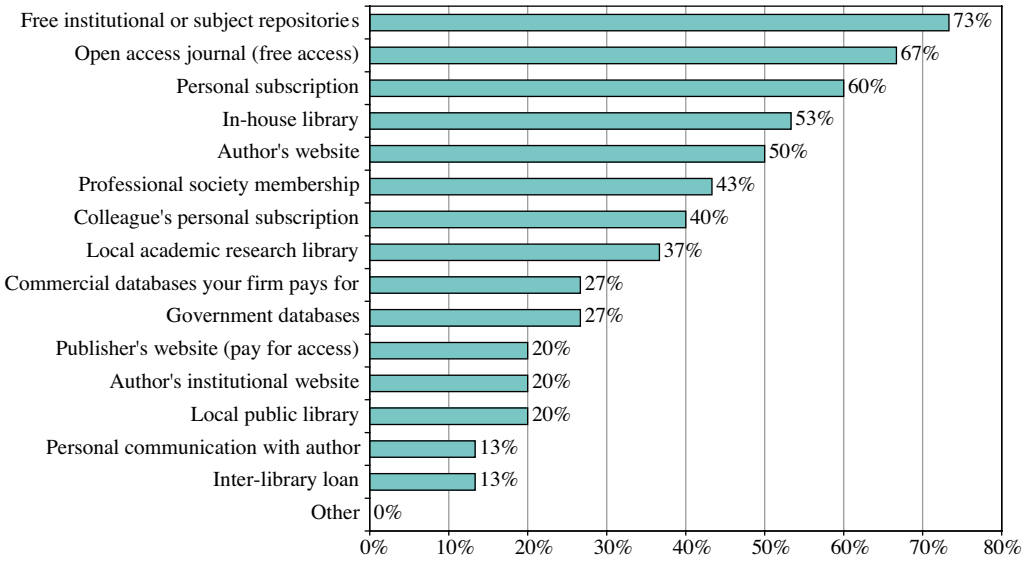
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure IQ12a Average frequency of access by method on a scale of 1 (less often than every 2-6 months) to 5 (daily)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure IQ12b Percentage of incubator firm respondents using these access methods on a monthly basis or more frequently



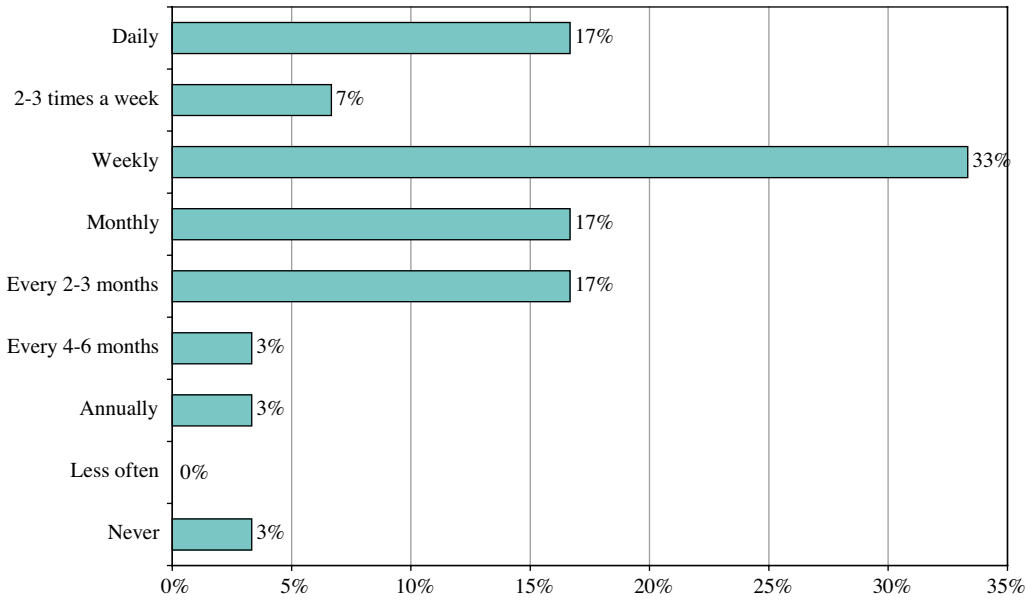
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q13 Approximately, how often do you read or consult research articles, either in journals or individually, and in either print or electronic form?

Looking specifically at access and use of research articles, incubator respondents were asked how often they read or consulted research articles, either in journals or individually, and in either print or electronic form.

No less than 73% reported reading or consulting research articles on a monthly or more regular basis, 57% on a weekly or more regular basis and 17% on a daily basis (N=30).

Figure IQ13 Frequency of reading or consulting research articles



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

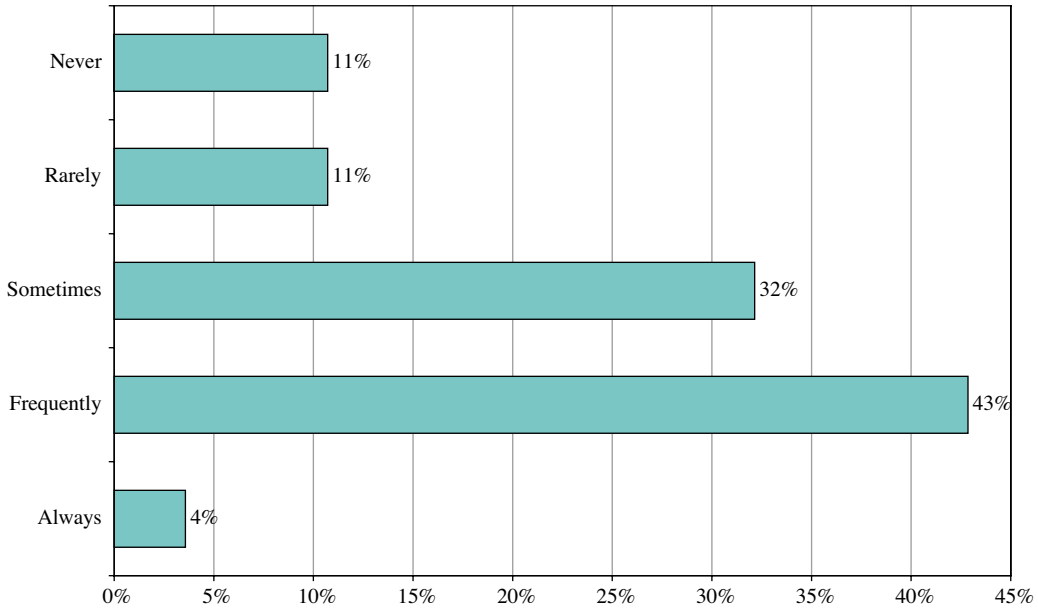
Q14 Approximately, how many research articles do you read or consult each year, either in print or electronic form?

Asked how many research articles they read or consult each year, incubator firm respondents reported an average 63 articles per year (N=24).

Q15 Do you have any difficulty accessing the FULL TEXT of the research articles you need?

Asked about the frequency of access difficulties relating to research articles, 46% of incubator firm respondents said they always or frequently had difficulty getting the research articles they needed, and a further 32% said they sometimes had difficulties. Just 3 reported that they never experienced access difficulties (N=28).

Figure IQ15 Frequency of access difficulty relating to research articles



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q16 During the past 12 months, approximately how many research articles did you find it difficult to access?

The number of research articles incubator firm respondents had difficulty accessing during the last year varied, with the average being 30 articles presenting difficulties during the last year.

Given that they report reading or consulting an average of 63 per year, access difficulties were equivalent to 48% of readings (including open access article readings) (N=19).

Q17 In relation to the LAST RESEARCH ARTICLE YOU HAD DIFFICULTY ACCESSING, how important was it to gain access to the full text of the article? ***(On a scale of 1 "not at all important" to 5 "extremely important")***

Incubator firm respondents attached importance to the articles they had difficulties accessing.

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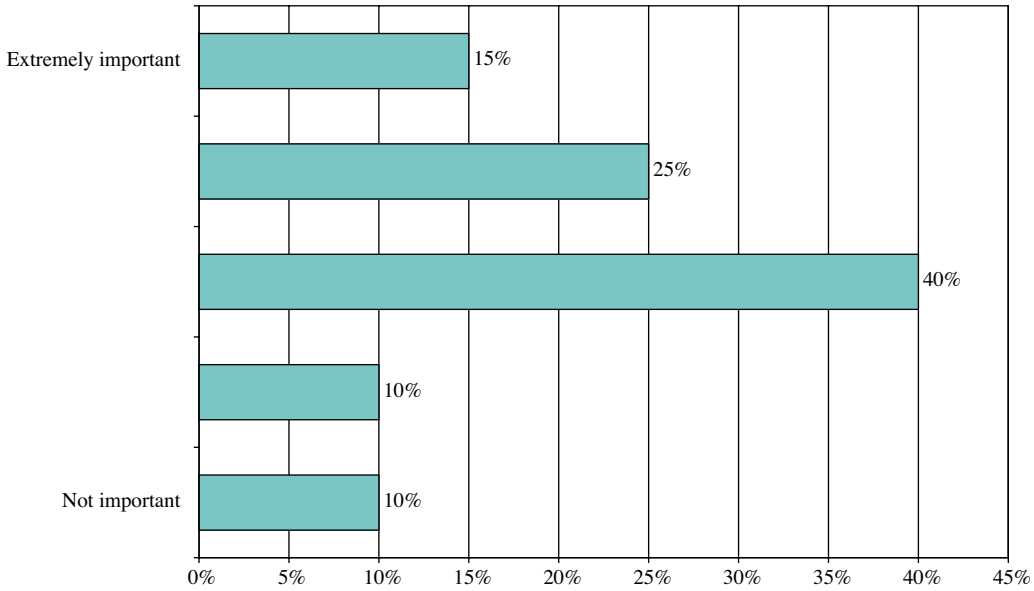
Figure IQ17 Importance of the last article presenting access difficulties on a scale of 1 to 5



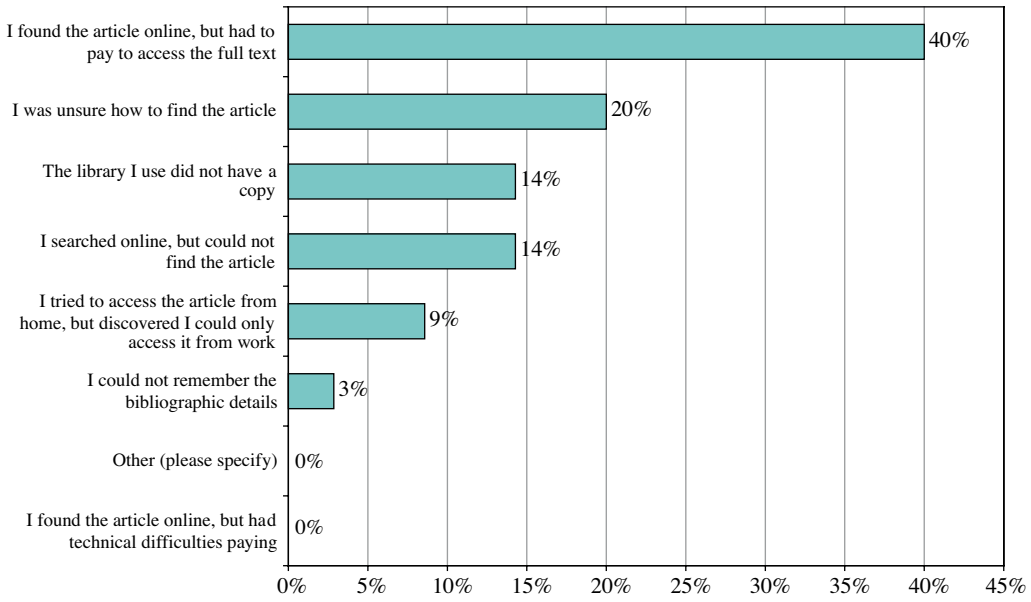
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q18 In relation to the last article you had difficulty accessing, what particular difficulties did you encounter?

The main difficulties encountered in relation to the last article incubator respondents had difficulty accessing included: I found the article online, but had to pay to access the full text (40%), I was unsure how to find the article (20%), I searched online, but could not find the article and the library I use did not have a copy (14%) (N=35). Approximately 63% of difficulties encountered related in some way to toll access barriers.

That a relatively high proportion were unsure how to find the article suggests lower levels of information literacy among the incubator firms.

Figure IQ18: Access difficulties encountered by incubator firm respondents

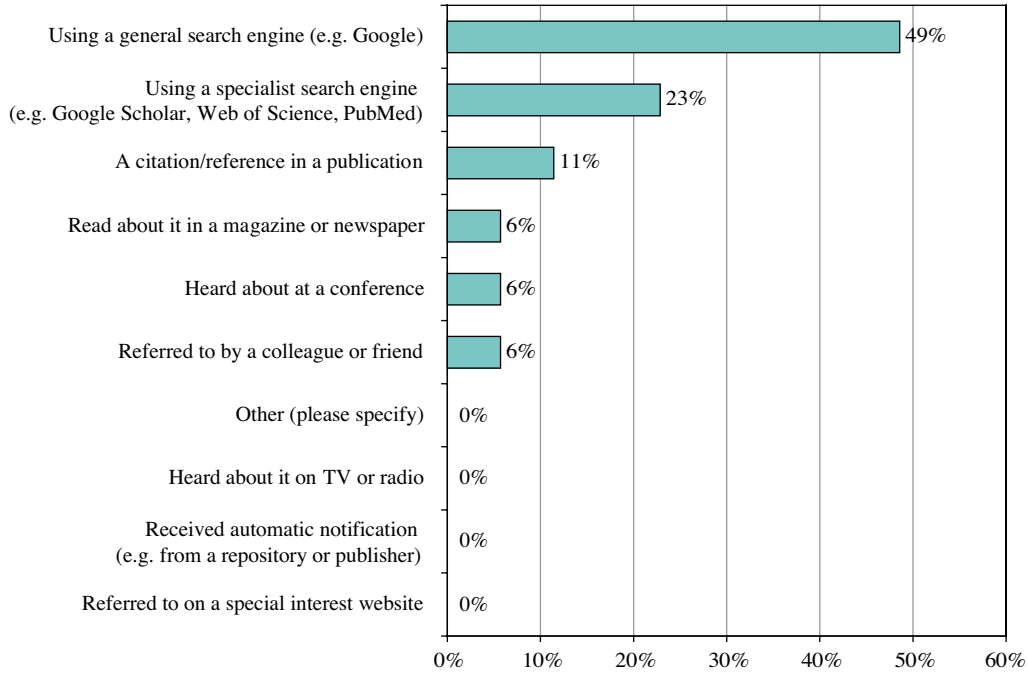


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q19 In relation to the last article you had difficulty accessing, how did you learn about it?

The main means of discovery of the last article incubator firm respondents had difficulty accessing was through the use of a general search engine (*e.g.* Google) (49%), followed by using a specialist search engine (*e.g.* Google Scholar, Web of Science, PubMed) (23%) (N=35).

Figure IQ19 Discovery of articles presenting access difficulties

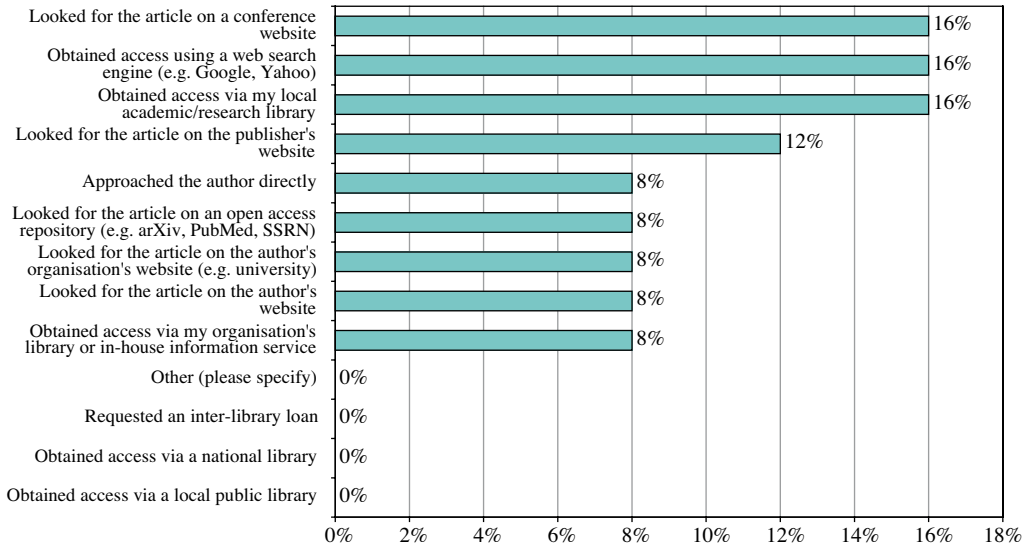


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q20 In relation to the last article you had difficulty accessing, what did you do to obtain access to the FULL TEXT content of the article?

Asked what they did to obtain the last article they had difficulty accessing, incubator respondents reported that they: looked for the article on a conference website, obtained access using a web search engine (*e.g.* Google, Yahoo), and obtained access via my local academic/research library (16%). None used inter-library loan or public libraries (N=25).

Figure IQ20 Access approaches used for articles presenting access difficulties



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q21 In relation to the last article you had difficulty accessing, approximately how much time did you spend trying to get access to it (whether successful or not)?

Asked how long they spent trying to access the last article they had difficulties accessing, incubator firm respondents said the average time was 58 minutes (N=18).

Q22 How did you intend to use the last article you had difficulty accessing?

The vast majority of incubator firm respondents intended to use the last article they had difficulty accessing for work purposes (95%) (N=21).

Q23 Is your experience with the last article you had difficulty accessing typical of the difficulties you have?

Only one of the incubator respondents said that the experience was not typical (*i.e.* answering "no").

Q24 If your firm has any CORPORATE SUBSCRIPTIONS to research journals, approximately how much does it pay each year in total?

Q25 If your firm has paid to access individual research articles (*e.g.* pay-per-view) in the past 12 months, approximately how much has it spent in total?

Q26 If you have any PERSONAL SUBSCRIPTIONS to research journals, approximately how much do you pay each year in total?

Q27 If you personally have paid to access individual research articles (*e.g.* pay-per-view) in the past 12 months, approximately how much have you spent in total?

Looking at expenditure on article access, incubator firm respondents were asked about corporate and personal subscription and pay-per-view expenditures. They reported:

- Average corporate journal subscription spending of DKK 1 526 per year (N=20);
- Average corporate pay-per-view spending of DKK 1 066 per year (N=19);
- Average personal subscription spending of DKK 510 per year (N=20); and
- Average personal pay-per-view spending of DKK 464 per year (N=14).

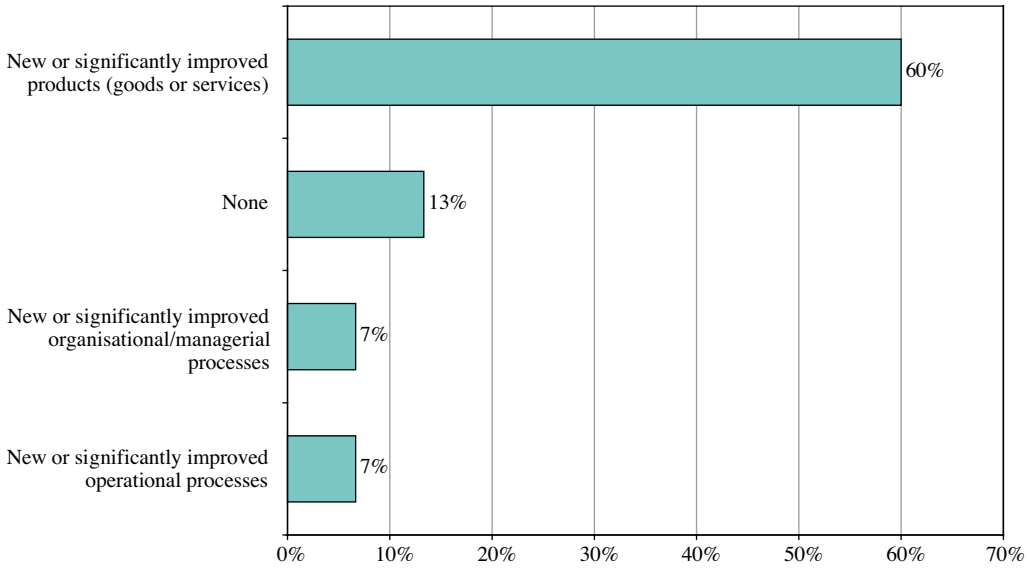
The importance and value of access to academic research

Questions in this section were designed to help us understand how important access to research information is for the firms. We were interested in the extent to which the information found in research articles contributes to innovation and the value of that innovation to the firms. In particular, we wanted to know how important access to academic research is to the timeliness of product or service development and about delays or failures in product development that could be due to lack of access to academic research. We were interested in products and processes developed by the firms and/or developed externally and introduced by the firms (*i.e.* in the impacts on innovation, not simply on research).

Q28 Has your firm developed or introduced any new or significantly improved products or processes during the last 3 years (whether new to your firm, new to the local market or new to the world)?

Sixty per cent of incubator firms reported introducing new or improved products or services during the last three years, 7% had introduced new or improved operational processes, and 7% had introduced new or improved organizational or managerial processes. Some 13% had not introduced innovations during the last three years, reflecting that a number had not yet brought anything to market (N=30).

Figure IQ28 Introduction of new products, services and processes



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q29 Of the PRODUCTS developed or introduced in the last 3 years, approximately what percentage of them would have been delayed or abandoned if access to academic research had not been possible?

Incubator firm respondents suggested that an average of 42% of the products developed or introduced during the last three years would have been delayed or abandoned without access to academic research (N=17).

Q31 Approximately, what contribution to sales do PRODUCTS developed or introduced in the last 3 years make (or what contribution will they make once introduced)?

Incubator respondents said that products developed or introduced in the last three years had contributed or would contribute around 62% of sales (N=19).

Q32 Of the PROCESSES developed or introduced in the last 3 years, approximately what percentage of them would have been delayed or abandoned if access to academic research had not been possible?

An average of 32% of the processes developed or introduced over the last three years would have been delayed or abandoned without access to academic research (N=15).

Q34 Approximately, what is the value of cost savings that PROCESSES developed or introduced in the last 3 years have enabled (or what savings will they enable once introduced)?

The estimated average value of cost savings from processes developed or introduced over the last three years was DKK 63 000 among incubator firm respondents (N=12).

Q35 Approximately, what was the average time lag (in years) between the academic research and the first introduction of these new products and new processes?

Respondents reported an estimated average time lag between academic research and the first introduction of new products or processes at 4.1 among the incubator respondents – reflecting their earlier stage operation (N=15).

Q36 In your opinion, approximately how much longer might it have taken to develop or introduce these new products and processes without the contributing academic research?

Incubator firm respondents suggested that it would have taken an average of 2.7 years longer to develop or introduce the new products or processes in the absence of contributing academic research (N=13).

Innovating firms >

Innovating firms are those having introduced new or improved products or services in the last three years. There were a total of 79 innovating firm responses, although not all answered all the questions and some questions sought multiple responses and it is the share of total responses that is reported. Hence, wherever the presentation deviates from N=79 it is noted.

Demographics

The survey began with questions about the respondents and their firms.

Q3 Approximately, how many employees are there in your firm?

The innovating firms were small, but somewhat larger than incubator firms, with 35% reporting less than 5 employees, and a further 27% less than 20.

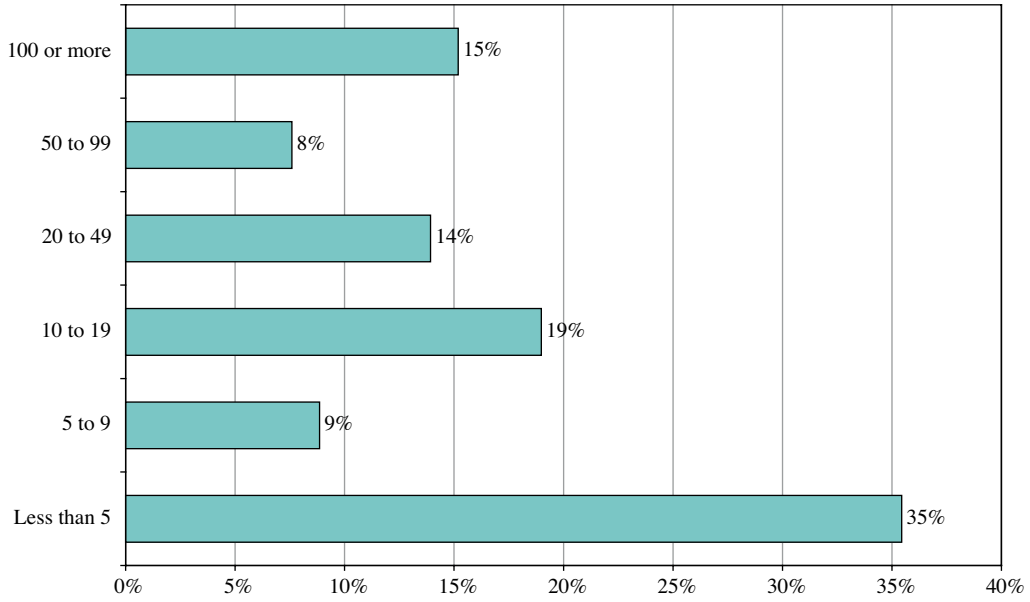
Q4 Approximately, what is your firm's annual revenue from SALES (on average over the last 3 years)?

Reported annual sales revenues varied, with the average being DKK 158 million per year.

Q5 Approximately, what is your firm's annual R&D spending (on average over the last 3 years)?

Reported R&D spending also varied, with the average annual R&D spending being DKK 6.4 million on sales of DKK 158 million, or 4%.

Figure IQ3 Size of innovating firms (number of employees)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q6 Which best describes the main activity of your firm?

Among innovating firms 64% described their activities as manufacturing, 21% as services and 15% as software/content.

Information needs, access levels and costs

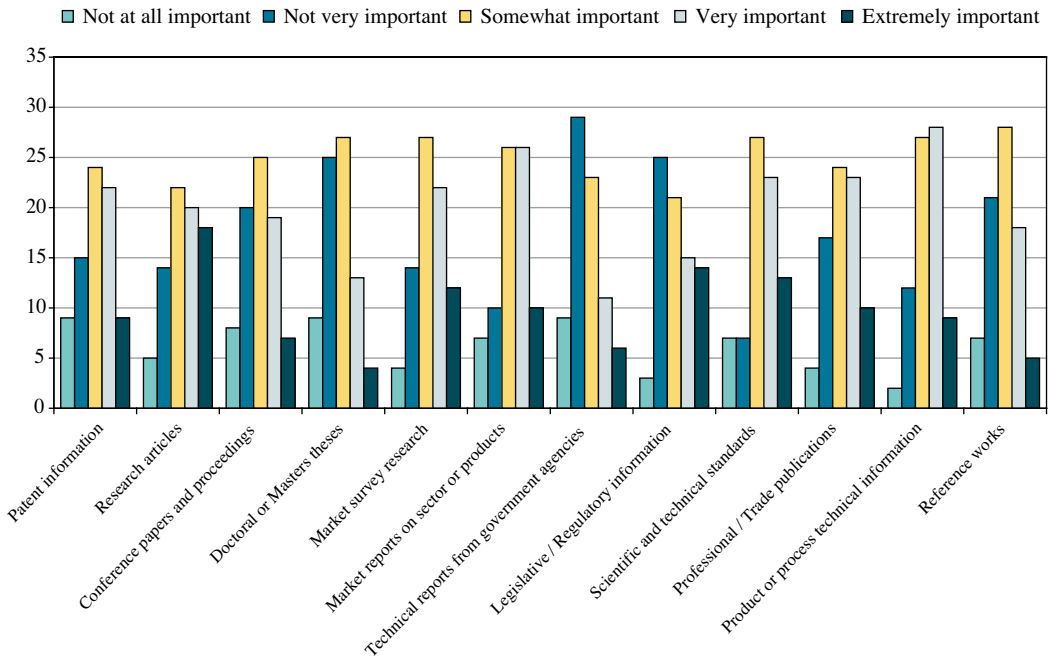
The second section of the questionnaire explored the respondents' information needs, how they discover and access information, and whether there are any barriers to access or gaps in what is available to them.

Q9 How important is it that you have access to the types of information listed below?
(On a scale of "not at all important" to "extremely important")

Figure IQ9 shows the respondents' rankings of the importance of various information types (N=79).

Asked to rank the importance of various types of information on a scale from 1 (not at all important) to 5 (extremely important) innovating firm respondents' rated research articles, product and process technical information, and scientific and technical standards the highest (average score 3.4), followed by market survey research and market reports on sector or products (average score 3.3).

Figure IQ9 Importance of each information type



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

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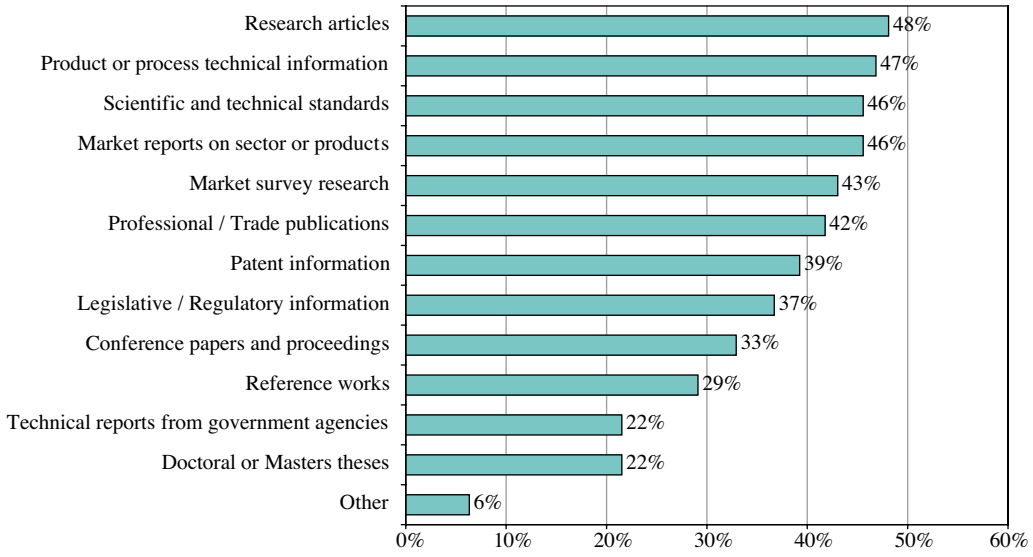
Figure IQ9a Average importance rating on a scale of 1 (not at all important) to 5 (extremely important)

Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Forty-eight per cent of innovating firm respondents rated research articles as very or extremely important, 47% product and process technical information, and 46% scientific and technical standards and market reports on sector or products.

Figure IQ9b Percentage of innovating firm respondents rating information type as very or extremely important



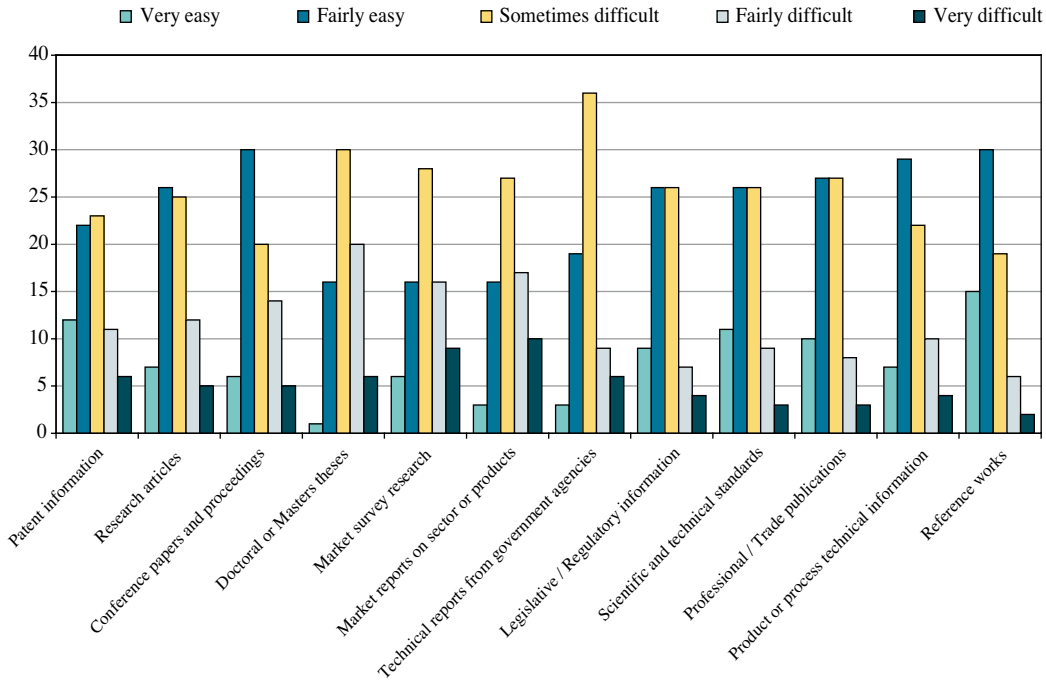
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q10 How easy is it for you to gain access to the FULL TEXT content of the information you need?
(On a scale of "very easy" to access the full text content to "very difficult")

Asked how easy it was for them to gain 'full text' access to these various types of information it was clear that many innovating firms experience some access difficulties.

Asked to rate the ease of gaining access to the 'full text' of various types of information on a scale from 1 (very easy) to 5 (very difficult) innovating firm respondents' rated market reports on sector or products and Doctoral and Masters theses the most difficult of the information types to access in full (average score 3.2), followed by market survey research (average score 3.1), and technical reports from government agencies (average score 2.9).

Figure IQ10 Ease of access to each information type



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

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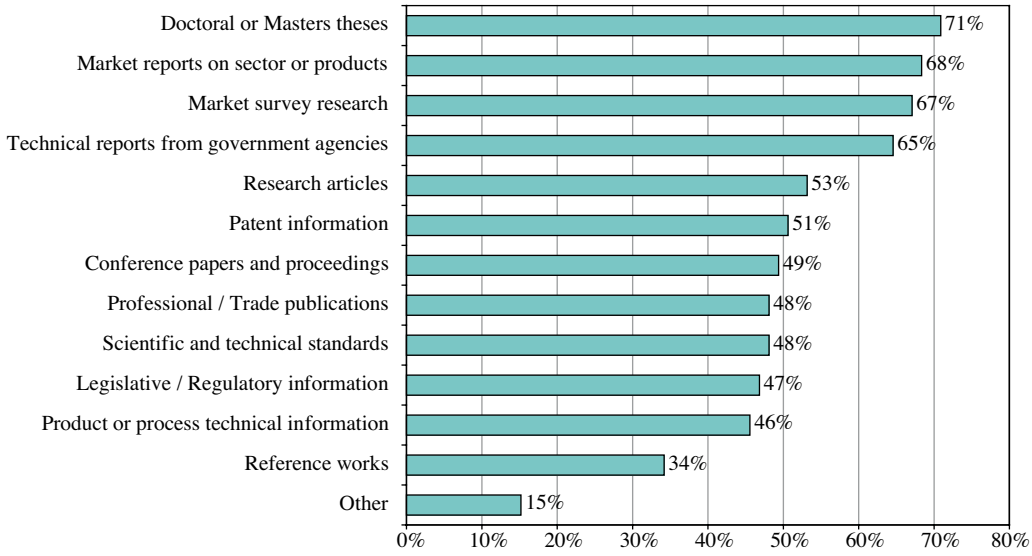
Figure IQ10a Average access difficulty rating on a scale of 1 (very easy) to 5 (very difficult)

Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

More than 70% of respondents reported having difficulties accessing Doctoral or Masters theses, and 60% or more had difficulties accessing market reports on sector or products, market survey research and technical reports from government agencies.

Figure IQ10b Percentage innovating firm respondents for whom access is very, fairly or sometimes difficult

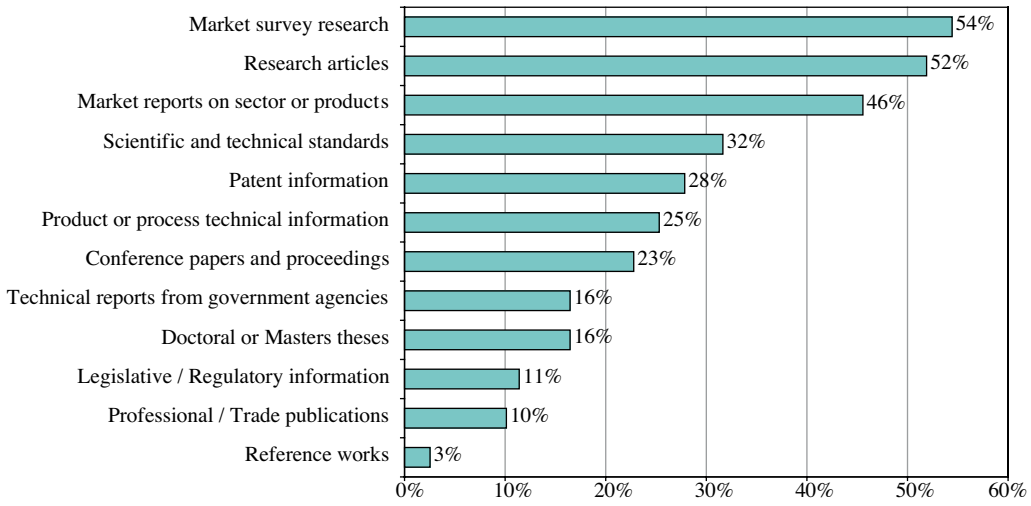


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q11 If you could improve access to any of these types of information, which would you choose?

To further explore their access needs and priorities, innovating firm respondents were asked which of the information types they would like to have improved access to. Some 54% sought better access to market survey research, 52% sought better access to research articles and 46% to market reports on sector or products.

Figure IQ11a Percentage of innovating firm respondents wanting improved access by information type



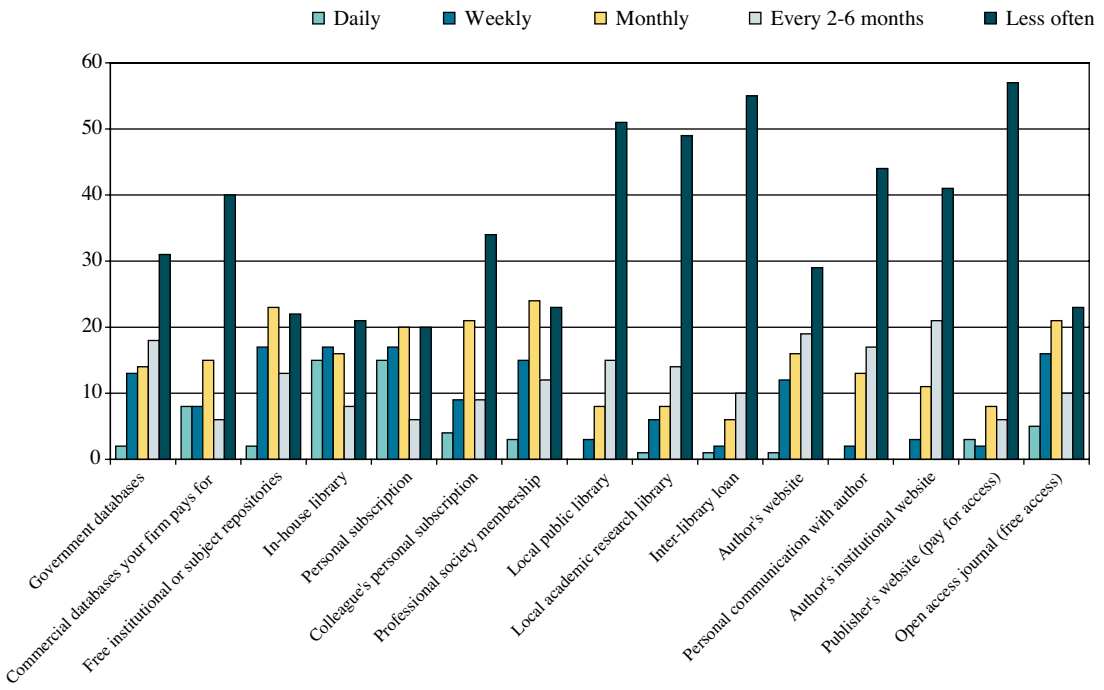
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q12 How often do you use the following ways to access the FULL TEXT content of the information you need?

Turning to search and discovery and frequency of access and use, innovating firm respondents were asked how frequently they used various means of access to the information they need. Personal subscriptions and in-house libraries were the most commonly used access means, followed by open access journals, free institutional or subject repositories and professional society membership. The least frequently used methods include inter-library loan, local public library and publisher's website (*i.e.* pay-per-view).

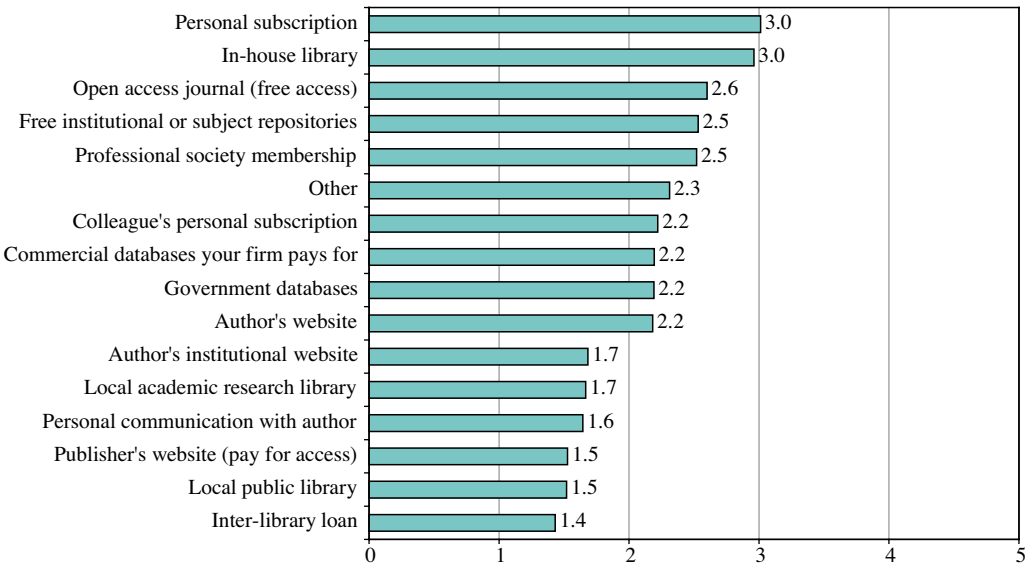
More than 60% of respondents reported using personal subscriptions and in-house library monthly or more frequently, 53% free institutional or subject repositories, open access journal (free access) and professional society membership. Inter-library loans and local public library were the least used.

Figure IQ12 Frequency of access by access methods



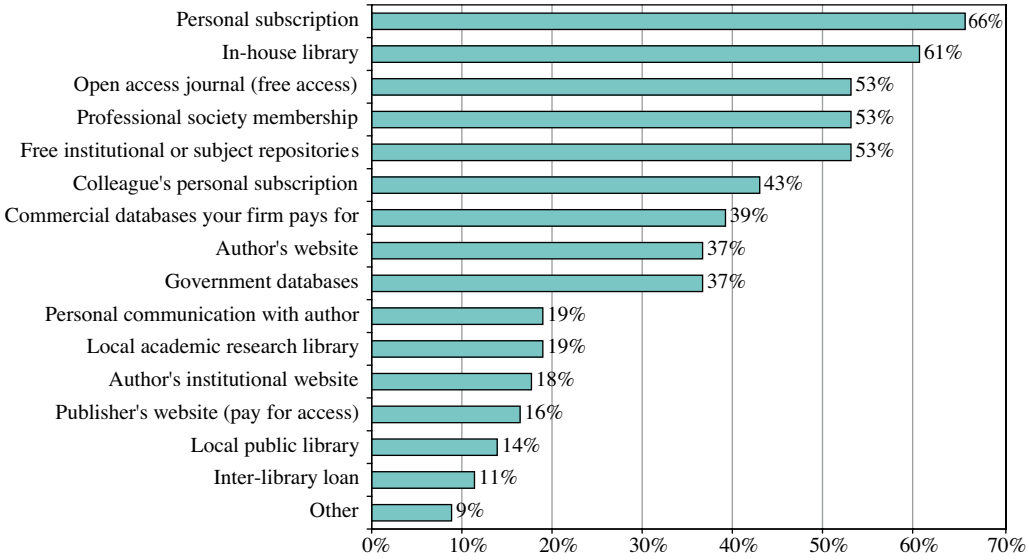
Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure IQ12a Average frequency of access by method on a scale of 1 (less often than every 2-6 months) to 5 (daily)



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Figure IQ12b Percentage of innovating firm respondents using these access methods on a monthly basis or more frequently



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q13 Approximately, how often do you read or consult research articles, either in journals or individually, and in either print or electronic form?

Looking specifically at access and use of research articles, innovating firm respondents were asked how often they read or consulted research articles, either in journals or individually, and in either print or electronic form.

No less than 66% of respondents reported reading or consulting research articles on a monthly or more regular basis, 43% on a weekly or more regular basis and 10% on a daily basis (N=77).

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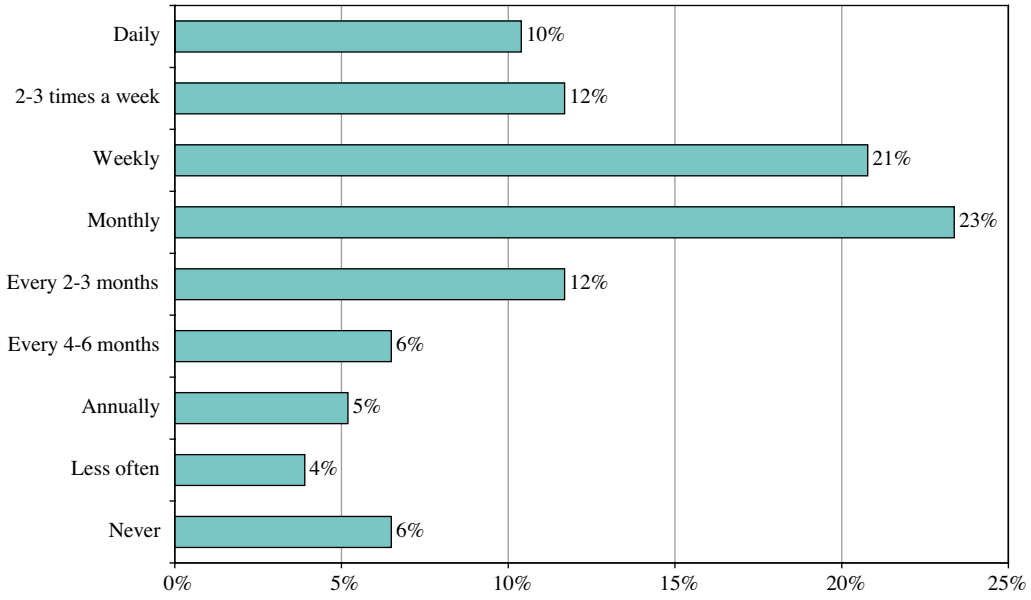
Figure IQ13 Frequency of reading or consulting research articles



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

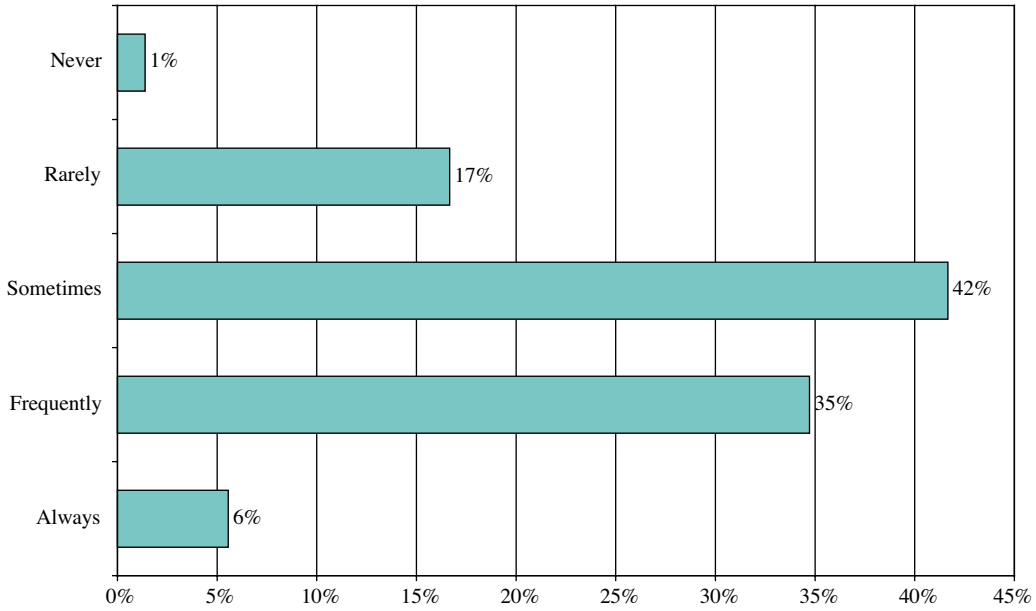
Q14 Approximately, how many research articles do you read or consult each year, either in print or electronic form?

Asked how many research articles they read or consult each year, innovating firm respondents reported an average 55 articles per year (N=65).

Q15 Do you have any difficulty accessing the FULL TEXT of the research articles you need?

Asked about the frequency of access difficulties relating to research articles, 40% of innovating firm respondents said they always or frequently had difficulty getting the research articles they needed, and a further 42% said they sometimes had difficulties. Just one reported that they never experienced access difficulties (N=72).

Figure IQ15 Frequency of access difficulty relating to research articles



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q16 During the past 12 months, approximately how many research articles did you find it difficult to access?

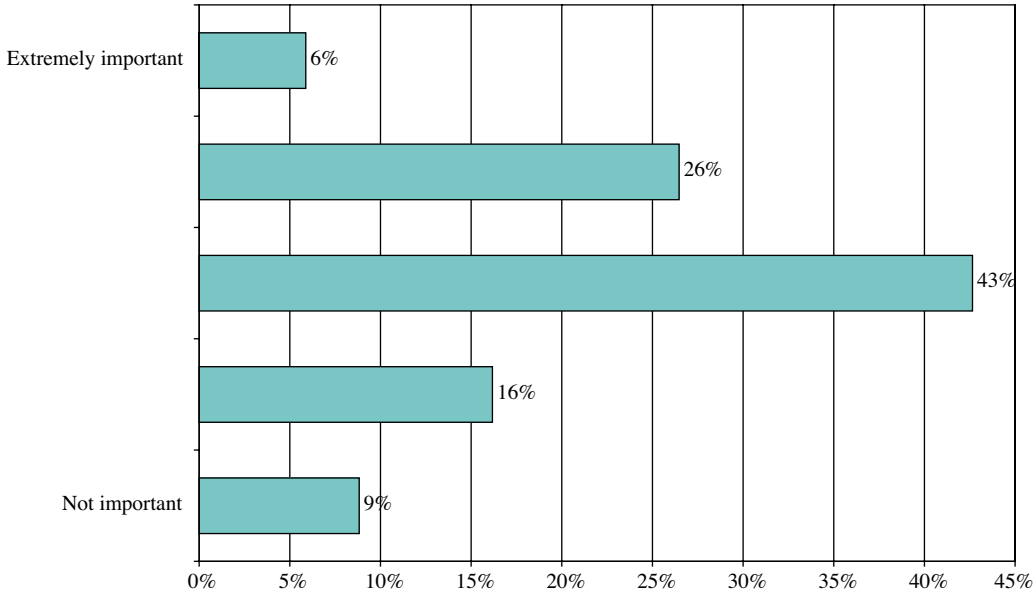
The number of research articles innovating firm respondents had difficulty accessing during the last year varied, with the average being 18 articles presenting difficulties during the last year (N=58).

Given that they report reading an average of 55 per year, access difficulties were equivalent to 33% of readings (including open access article readings).

Q17 In relation to the LAST RESEARCH ARTICLE YOU HAD DIFFICULTY ACCESSING, how important was it to gain access to the full text of the article? ***(On a scale of 1 "not at all important" to 5 "extremely important")***

Innovating firm respondents attached importance to the articles they had difficulties accessing.

Figure IQ17 Importance of the last article presenting access difficulties on a scale of 1 to 5

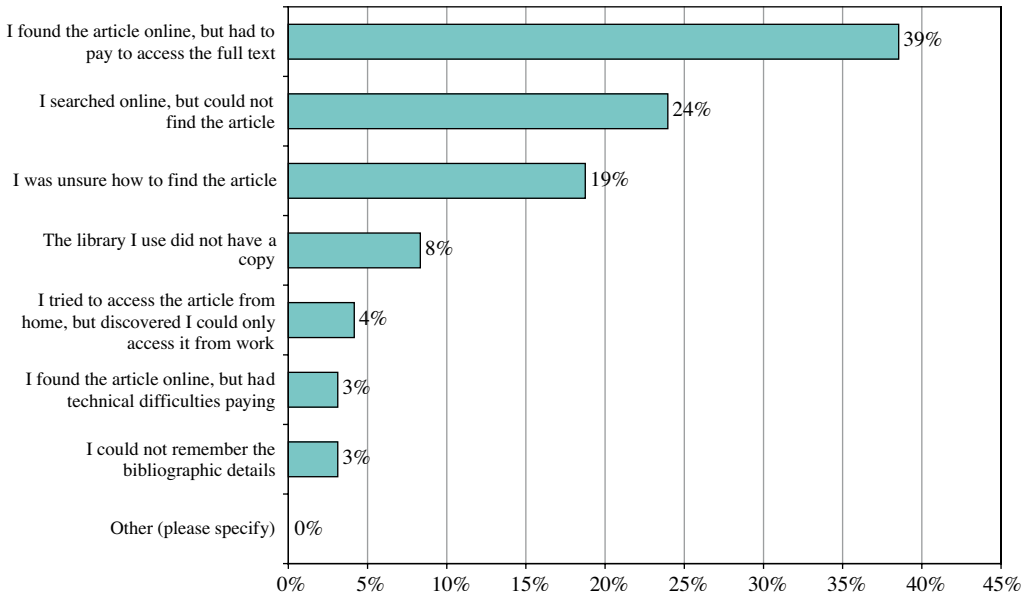


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q18 In relation to the last article you had difficulty accessing, what particular difficulties did you encounter?

The main difficulties encountered in relation to the last article innovating firm respondents had difficulty accessing included: I found the article online, but had to pay to access the full text (39%), I searched online, but could not find the article (24%) and I was unsure how to find the article (19%). Approximately 54% of difficulties encountered related in some way to toll access barriers.

Figure IQ18 Access difficulties encountered by innovating firms

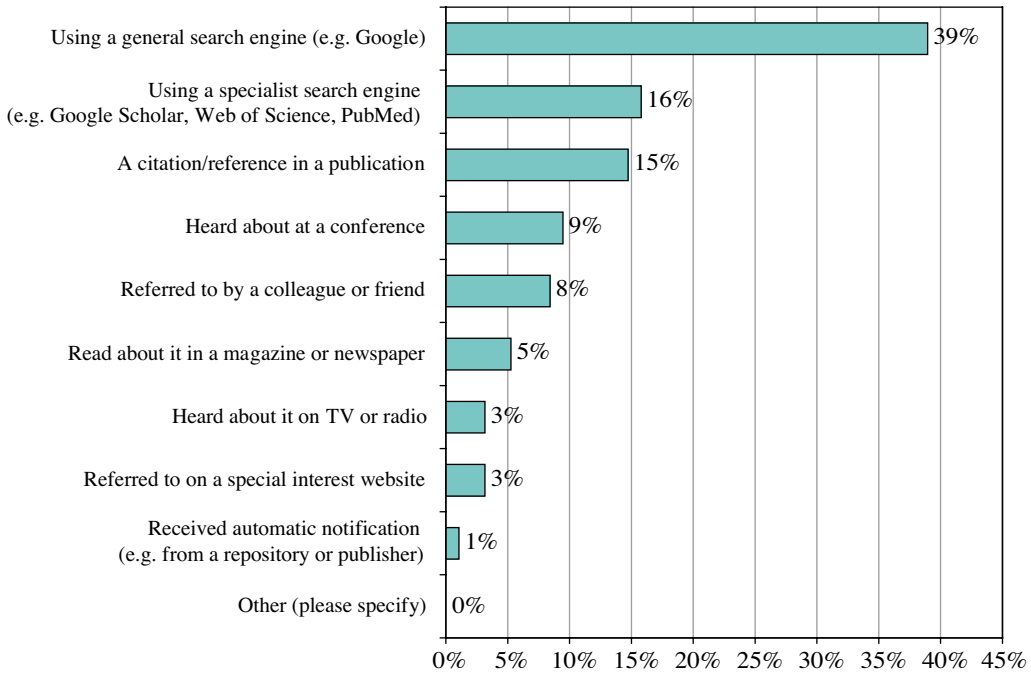


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q19 In relation to the last article you had difficulty accessing, how did you learn about it?

The main means of discovery of the last article respondents had difficulty accessing was through the use of a general search engine (*e.g.* Google) (39%), followed by using a specialist search engine (*e.g.* Google Scholar, Web of Science, PubMed) (16%) and a citation/reference in a publication (15%).

Figure IQ19 Discovery of articles presenting access difficulties

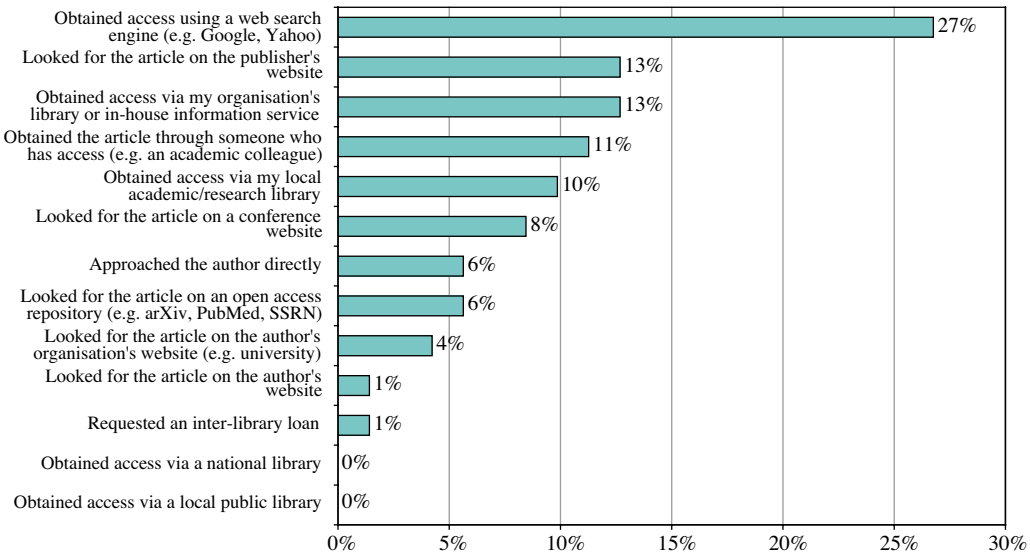


Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q20 In relation to the last article you had difficulty accessing, what did you do to obtain access to the FULL TEXT content of the article?

Asked what they did to obtain the last article they had difficulty accessing, innovating firm respondents reported that they: obtained access using a web search engine (*e.g.* Google, Yahoo) (27%), obtained access through an in-house library services and looked for it on the publisher's website (13%). Few used inter-library loan (N=71).

Figure IQ20 Access approaches used for articles presenting access difficulties



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q21 In relation to the last article you had difficulty accessing, approximately how much time did you spend trying to get access to it (whether successful or not)?

Asked how long they spent trying to access the last article they had difficulties accessing, innovating firm respondents said the average time was 50 minutes (N=59).

Q22 How did you intend to use the last article you had difficulty accessing?

The vast majority of innovating firm respondents intended to use the last article they had difficulty accessing for work purposes (82%) (N=67).

Q23 Is your experience with the last article you had difficulty accessing typical of the difficulties you have?

Only two of the innovating firm respondents said that the experience was not typical (*i.e.* answering "no").

Q24 If your firm has any CORPORATE SUBSCRIPTIONS to research journals, approximately how much does it pay each year in total?

Q25 If your firm has paid to access individual research articles (*e.g.* pay-per-view) in the past 12 months, approximately how much has it spent in total?

Q26 If you have any PERSONAL SUBSCRIPTIONS to research journals, approximately how much do you pay each year in total?

Q27 If you personally have paid to access individual research articles (*e.g.* pay-per-view) in the past 12 months, approximately how much have you spent in total?

Looking at expenditure on article access, innovating firm respondents were asked about corporate and personal subscription and pay-per-view expenditures. They reported:

- Average corporate journal subscription spending of DKK 2 127 per year (N=54);
- Average corporate pay-per-view spending of DKK 1 650 per year (N=53);
- Average personal subscription spending of DKK 510 per year (N=51); and
- Average personal pay-per-view spending of DKK 277 per year (N=47).

Hence, innovating firms appear to spend a little more on corporate subscriptions than the average across the entire sample.

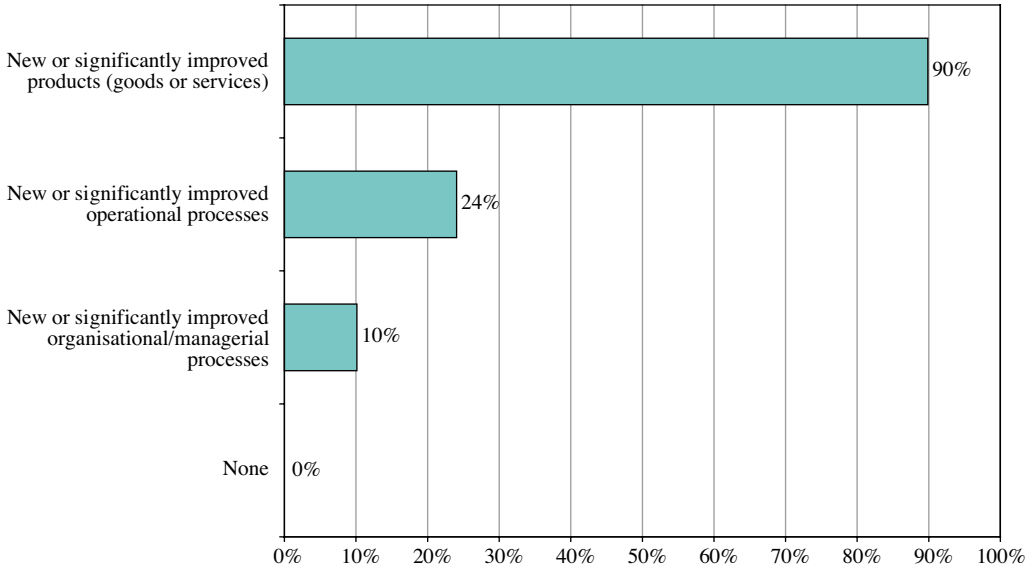
The importance and value of access to academic research

Questions in this section were designed to help us understand how important access to research information is for the firms. We were interested in the extent to which the information found in research articles contributes to innovation and the value of that innovation to the firms. In particular, we wanted to know how important access to academic research is to the timeliness of product or service development and about delays or failures in product development that could be due to lack of access to academic research. We were interested in products and processes developed by the firms and/or developed externally and introduced by the firms (*i.e.* in the impacts on innovation, not simply on in-house research).

Q28 Has your firm developed or introduced any new or significantly improved products or processes during the last 3 years (whether new to your firm, new to the local market or new to the world)?

Among innovating firms, 90% reported introducing new or improved products or services during the last three years, 24% had introduced new or improved operational processes, and 10% had introduced new or improved organizational or managerial processes (N=79).

Figure IQ28 Introduction of new products, services and processes



Source: Survey on Access to Research and Technical Information in Denmark (Authors' analysis).

Q29 Of the PRODUCTS developed or introduced in the last 3 years, approximately what percentage of them would have been delayed or abandoned if access to academic research had not been possible?

Innovating firm respondents suggested that an average of 27% of the products developed or introduced during the last three years would have been delayed or abandoned without access to academic research (N=58).

Q31 Approximately, what contribution to sales do PRODUCTS developed or introduced in the last 3 years make (or what contribution will they make once introduced)?

Innovating firm respondents said that products developed or introduced in the last three years had contributed or would contribute around 45% of sales (N=71).

Q32 Of the PROCESSES developed or introduced in the last 3 years, approximately what percentage of them would have been delayed or abandoned if access to academic research had not been possible?

An average of 20% of the processes developed or introduced over the last three years would have been delayed or abandoned without access to academic research (N=56).

Q34 Approximately, what is the value of cost savings that PROCESSES developed or introduced in the last 3 years have enabled (or what savings will they enable once introduced)?

The estimated average value of cost savings from processes developed or introduced over the last three years was DKK 522 000 among innovating firm respondents (N=45).

Q35 Approximately, what was the average time lag (in years) between the academic research and the first introduction of these new products and new processes?

Respondents reported an estimated the average time lag between academic research and the first introduction of new products or processes at 2.9 among the innovating firm respondents (N=56).

Q36 In your opinion, approximately how much longer might it have taken to develop or introduce these new products and processes without the contributing academic research?

Innovating firm respondents suggested that it would have taken an average of 2.3 years longer to develop or introduce the new products or processes in the absence of contributing academic research (N=49).