BUY OR BUILD

AN EXPLORATION OF THE TOTAL COST OF OWNERSHIP FOR A RESEARCH INFORMATION MANAGEMENT SYSTEM

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Report Title: Buy or build, an exploration of the total cost of ownership for a research information management system

Prepared for: Elsevier

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Scope:
This 2020 whitepaper, based on an investigation by Knowledge E for Elsevier, explores the total cost of ownership (TCO) and return on investment (ROI) of *Pure*, the global market leader in research information management system (RIMS) products and services, and "Do It Yourself" (DIY) solutions.

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PREFACE

It is essential for universities to understand and manage their research activities in order to improve funding streams and research outputs, which directly affect their global ranking positions, reputation and long-term impact. Many users of Elsevier's *Pure*, the current leading research information management system (RIMS) globally, have previously used internally developed "Do It Yourself" (DIY) systems for managing the many elements of the research ecosystem. In 2020, Elsevier wanted to establish a clear understanding of the total cost of ownership (TCO) and return on investment (ROI) of *Pure*, particularly as compared to DIY solutions.

To produce objective results, Elsevier engaged independent investigators. The resulting analysis presented in this whitepaper was carried out by a team of analysts affiliated with Knowledge E, an independent consultancy company with over 20 years' experience working in research information management for organisations unrelated to Elsevier.

Elsevier was involved in the process of identifying and inviting *Pure* clients to participate in the survey and interviews and remained in dialogue with the team of analysts throughout the work. Knowledge E's expert team conducted the survey and interviews. They then integrated these results with related research and authored the resulting whitepaper.

Throughout the process, Elsevier respected Knowledge E's professional expertise and commitment to objectivity, including Knowledge E's recommendation to include organisations that were not *Pure* clients in the investigation. Knowledge E investigators endeavoured to be as objective as possible. Although the limitations of the investigation do not allow for definitive conclusions, the general indications remain useful to many readers. Independent of the *Pure* vs. DIY comparisons discussed, the case studies, RIMS TCO Calculator and recommendations for institutions will be useful for any organisation considering whether to buy or build their research information management system.

Knowledge E
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EXECUTIVE SUMMARY

1. EXECUTIVE SUMMARY

Buy or build a research information management system (RIMS)?

The pro-active management of institutional research information is becoming increasingly important, but also increasingly complex. Assessing the value of tools and processes that facilitate effective and efficient management of the research enterprise is equally complex. Institutions need guidelines for estimating the value of potential solutions.

This whitepaper explores the total cost of ownership (TCO) and return on investment (ROI) of research information management systems (RIMS). In some regions, these regions, these systems are known as current research information systems (CRIS). These systems are collectively referred to as RIMS in this whitepaper. Multiple methods were employed to gather information for comparing TCO and ROI for "Do It Yourself" (DIY) systems and *Pure*, the RIMS by Elsevier.

Comparisons indicate that for most institutions a commercial RIMS like *Pure* delivers significantly lower cost and greater value for money than DIY alternatives. The extreme diversity of institutions consulted means that the comparisons presented here are very general indicators and are most useful at the very beginning of an institution's investigation into RIMS options. A RIMS TCO Calculator tool has been developed from the TCO and ROI criteria to assist institutional decision makers with the complex task of making similar comparisons in their specific environments.

1.1 Pure shows a significant TCO advantage over DIY

Pure shows a clear advantage in TCO when compared to DIY solutions, as shown in Table 1. For small institutions, the DIY TCO is approximately 6.5 FTE while *Pure* TCO is 4.7 FTE. For large institutions, the TCO advantage for *Pure* is even more significant: 55.6 FTE for DIY compared to 32.6 FTE for *Pure*. On average, *Pure* costs at least 28% - 41% less than DIY solutions.

Table 1. Total cost of ownership (TCO) comparison for first year

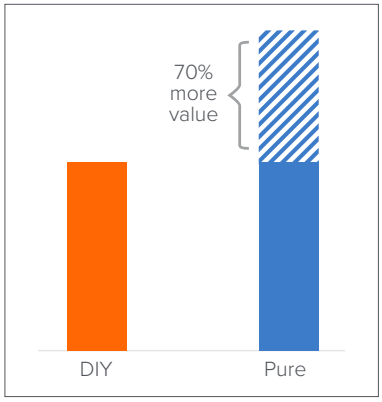
Total cost of ownership (TCO)	Build (DIY)	Buy *(Pure)*
One-time costs		
Small institution	variable*	2.5 FTE
Large institution	variable*	8.0 FTE
Annual operational costs (1 year)		
Small institution	3.8 FTE	2.2 FTE
Large institution	32.7 FTE	24.6 FTE
Annual opportunity costs (1 year)		
Small institution	2.7 FTE	0.0 FTE
Large institution	22.9 FTE	0.0 FTE
Total cost of ownership (TCO)		
Small institution	6.5 FTE*	4.7 FTE
Large institution	55.6 FTE*	32.6 FTE

Note: Small institution: ≤ 200 research active staff members. Large institution: ≥3000 research active staff members.
* Data for internal software development too variable to include. Actual TCO will be higher. Use RIMS TCO Calculator to compare using custom local estimates.

1.2 Pure provides 70% added value over DIY

All participants in the survey and interviews indicated that *Pure* provided more value to their institution than their previous solution (usually DIY). The overall added value of *Pure* ranged from 40% to 100%, averaging around 70% more value from *Pure* (see Figure 1).

Figure 1. The average added value of Pure

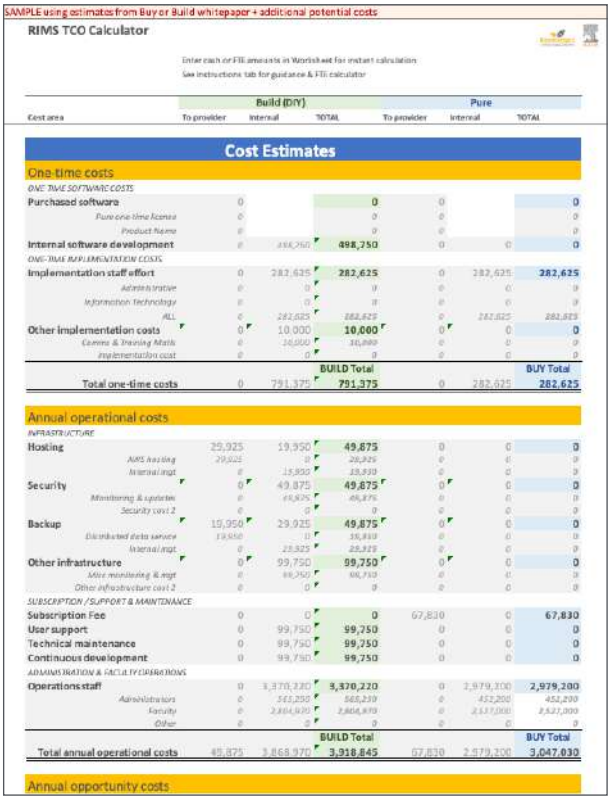


1.3 RIMS TCO Calculator enables customised local comparisons

The RIMS TCO Calculator is available as an Excel file through regional Elsevier representatives. Institutions enter real cost and value estimates for two RIMS solutions into a worksheet, as either cash or full-time equivalent (FTE) staff amounts. The RIMS TCO Calculator presents the TCO and ROI comparisons for all cost areas and recalculates instantly to reflect changes made in the worksheet.

A snapshot view of the RIMS TCO Calculator is presented in Figure 2. Contact your regional Elsevier representative to access the RIMS TCO calculator or refer to the contact details on page 2 of the whitepaper.

Figure 2. RIMS TCO Calculator snapshot


SAMPLE using estimates from Buy or Build whitepaper + additional potential costs

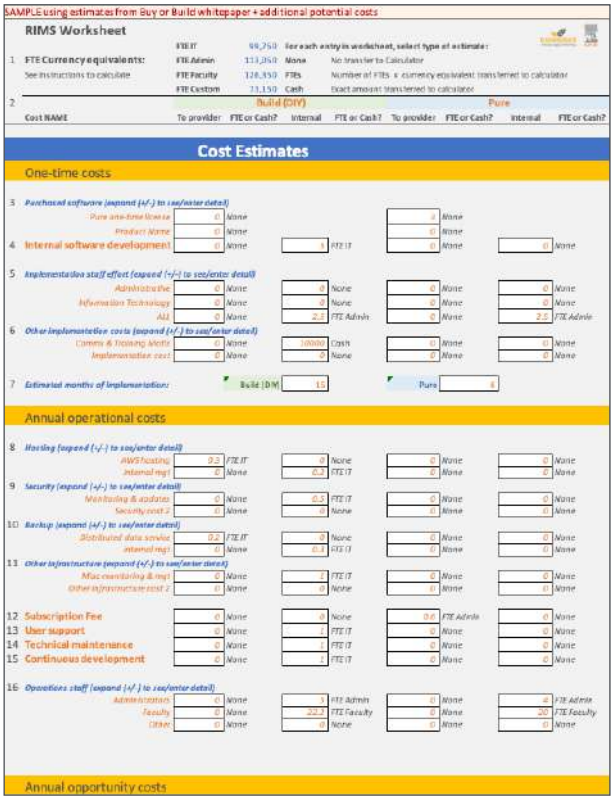
RIMS TCO Calculator

Cost Estimates

One-time costs

Annual operational costs

Annual opportunity costs


SAMPLE using estimates from Buy or Build whitepaper + additional potential costs

RIMS Worksheet

Cost Estimates

One-time costs

Annual operational costs

Annual opportunity costs

1.4 Institutions can further reduce TCO for RIMS solutions

Based on their experiences implementing and operating both DIY and *Pure* solutions, participants indicated that institutions themselves can reduce their TCO of *Pure* by up to 50% if they follow some simple recommendations.

- **Buy instead of build:** DIY solutions are significantly more costly and provide less value than a commercial RIMS.
- **Host in the cloud:** Internal hosting requires substantial resources, whereas hosting in the cloud leverages economies of scale.
- **Prepare before implementation:** By having a dedicated project team, empowered to take quick decisions, implementation will be faster and require less resources.
- **Implement the rollout in stages:** By limiting the initial stage of implementation, the RIMS can be operational sooner, provide practice for later stages and deliver value and return on the investment earlier.
- **Streamline the upgrade process:** Each upgrade to a RIMS requires testing, deployment and internal communication. By planning upgrade protocols carefully, resources are saved.
- **Apply best practices from other institutions:** To avoid pitfalls and minimise resource requirements, every institution is encouraged to talk to other institutions and the provider to learn about best practices.

1.5 Good RIMS decisions require careful consideration of many factors

Managing institutional research information is an increasingly complex and critical challenge for universities. Selecting the most effective and efficient solution is equally complex and critical.

Survey and interview responses indicate that Elsevier's *Pure* RIMS product provides added value and lower cost compared to DIY solutions. But given the costs and return on investment at stake, decision makers may be overwhelmed by the many factors involved in a RIMS solution decision, implementation and operation. The experiences of participants in this investigation, most of whom are intimately familiar with at least two types of RIMS solutions, suggest that decision makers should:

- Consider all the relevant variables involved in the operation of a RIMS solution, including careful assessment of risks (see section 4. Costs & value),
- Consider all the relevant variables involved in a RIMS solution, including careful assessment of risks (see section 4. Costs & value),
- Use the RIMS TCO Calculator to guide cost and value estimations and comparisons (see section 5, RIMS TCO Calculator),
- Learn from colleagues at similar institutions about their experience with different factors (see section 6, Case studies),
- Clarify leadership of the RIMS solution and empower internal teams for efficient management to reduce TCO (see section 7, Recommendations), and
- Ensure that decision making and planning are designed to balance institutional goals and assets with realistic assessments of cost, value and risk.

The costs and value comparisons between DIY and *Pure* detailed in this whitepaper, along with case studies, tips for how institutions can reduce TCO, and the RIMS TCO Calculator, provide an introduction to these issues. The benchmark indicators offer valuable orientation for decision-makers. The practical, experience-based guidance and tools support institutions in being systematic in their approach to their RIMS decision.

Reliable integration of relevant cost and value information is essential for making evidence-based decisions about the RIMS solution that will best enable institutions to drive, support and highlight their research excellence.

2 INTRODUCTION

2. INTRODUCTION

Pro-actively managing institutional research information is becoming increasingly important, but also increasingly complex. Equally complex is assessing the value of tools and processes that facilitate effective research management. Institutions need guidelines for estimating and comparing the value of potential solutions.

The increasing complexity of research information management is driven by evolving national and institutional research performance assessments requirements, the movement towards open access and open science, and the overall trend towards more competitive research funding.

Universities and research institutions must pro-actively track the relationship between inputs (talent, infrastructure, grants and other research income), outputs (articles, books, datasets) and outcomes (social impact statements, patents, citations and other metrics). Without systematic tracking of the data about their research enterprise, institutions risk losing millions in grant funding, suffering a drop in placement in university rankings or facing severe financial penalties due to non-compliance.

To meet these needs, institutions have developed different approaches for managing their research information. Some choose a "Do-It-Yourself" (DIY) approach by developing new systems in-house, with technology staff either writing computer programs from scratch or integrating open source software. Other institutions choose to buy a commercially managed software solution with related services.

Over the two last decades, the commercial market has developed several solutions typically labelled research information management systems (RIMS) or current research information systems (CRIS). In this paper, we refer to these systems as RIMS.

Both types of solutions, commercial or DIY, require substantial time, manpower and money to implement, run, and continuously develop to adjust to evolving research, technology, and leadership environments. Institutions need useful methods for making decisions about such a significant solution.

This whitepaper synthesises data from a survey of research administrators, accompanied by in-depth interviews and integrates it with desk research of related material and case studies of university experiences with DIY solutions and *Pure* to generate:

- Criteria for estimating the TCO of *Pure*, the RIMS from Elsevier, and comparing it to a DIY option,
- A comparison of *Pure* and DIY solutions in terms of TCO and return on investment (ROI),
- Trends in research manager preferences and perspectives regarding aspects of *Pure* and DIY solutions,
- Recommendations for institutions to further reduce TCO, and
- Recommendations for Elsevier that could reduce implementation time and operational costs for *Pure* clients.

Every institution's research enterprise is different, but by leveraging user informed TCO and ROI criteria, reviewing user-informed perspectives, and investigating diverse client experiences, research administrators are better prepared to make informed decisions about how to best manage their research information.

3 INVESTIGATION DESIGN

3. INVESTIGATION DESIGN

3.1 Objectives

The overall objective of the investigation was to assess the total cost of ownership (TCO) and return on investment (ROI) of *Pure*, in relation to "Do-It-Yourself" (DIY) alternatives.

Sub-objectives include the following:

- Develop criteria for a TCO and ROI calculator that institutions can use to support their internal planning when considering whether to buy or build a RIMS,
- Compare *Pure* with DIY RIMS solutions to identify areas that are of particular value and benefit for either alternative,
- Identify areas or activities that are costly, in terms of implementation or operation, to:
    - provide recommendations and guidance to institutions on how to reduce their TCO for their RIMS (DIY or *Pure*), and
    - inform Elsevier's *Pure* development plans to identify areas where TCO could be further reduced.

The sections below describe the methodology and investigation questions in more detail, followed by detailed comparison of average responses, presentation of the RIMS TCO Calculator, case studies of institutional RIMS experiences and recommendations for institutions and *Pure* that can reduce overall TCO and increase ROI.

3.2 Methodology

Surveys, interviews and desk research provided perspectives from *Pure* clients, non-Elsevier clients, *Pure* account managers, related publications and other material.

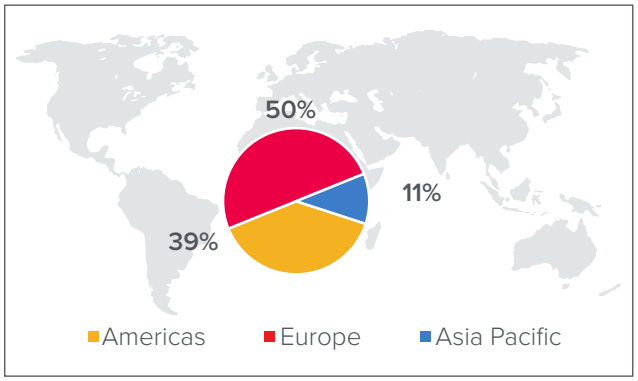
3.2.1 Data collection

Data collection focused on estimating a TCO for *Pure* and DIY solutions by assessing the following areas (see Appendix for guiding questions):

- One-time costs
    - One-time software license
    - One-time implementation costs (internal and external resources)
- Annual operational costs
    - Infrastructure costs (hosting, backups, data security, etc.)
    - Support & maintenance costs
    - Operations staff costs (estimated time for administrators and faculty using *Pure* compared to DIY or no system)
- Annual opportunity costs
    - Identification of the added value provided by *Pure* (e.g., public research profile, reporting & analytics capabilities, increased collaborations, better research performance, more grant funding) that would be unavailable or lost to a DIY solution.

An online survey was sent to all *Pure* clients as of September 2020. Of the invited participants, 13% submitted responses. A subset of these survey participants was interviewed to provide context for the survey and to enable the elaboration of case studies. Institutions represented were distributed across the globe: 50% from Europe, 39% the Americas, and 11% from the Asia-Pacific region (see Figure 3). The survey also reflected a range of institution sizes based on numbers of "research active" staff members.

Figure 3. Global distribution of survey responses.



Interviews were also held with non-Elsevier clients to identify potential differences in perspective, needs and driving forces for a commercial or DIY RIMS. Case studies and quotations included in this final publication were approved by participants.

The survey and interviews were supplemented by industry research and review of existing material (e.g., Elsevier *Pure* purchasing records, *Pure* conference presentations, previous publications on the topic). Elsevier's *Pure* account managers were also consulted to incorporate feedback they have received from clients related to both *Pure* and DIY solutions.

3.2.2 Analysis

Descriptive analysis of survey data, supported by interviews and related records and publications, generated estimated costs for DIY and *Pure* RIMS solutions. Due to the diversity of institutional characteristics, these estimates provide indications and trends rather than statistically conclusive results. Analytic formulas related to cost and value were used to develop the RIMS TCO Calculator, which allows institutions to enter precise local cost and value estimates to generate RIMS comparisons that are relevant for each institution's scenario. The RIMS TCO Calculator is available as an Excel file through regional Elsevier representatives, or see contact details on page 2.

FTE common metric

Due to the global nature of this investigation and the mix of internal staff time and direct cash payments to providers, a common metric of annual full-time equivalent personnel (FTE) was used instead of gross currency amounts. This enabled the integration and comparison of costs across low to high income countries and comparison of direct currency payments to a provider (commercial RIMS) with internal equivalent solutions (DIY RIMS) for which the real cost is in staff time. For example, the cost of a software license in a high income country might be twice the cost for a similar license in a low income country. But the average salary of an FTE who works on research information management at a university in the high income country is also twice the salary amount of a similar employee in a low income country. Representing costs as FTEs enables more appropriate TCO comparisons.

In the survey and interviews, participants were asked to provide estimates in FTE wherever possible. Cash amounts, such as *Pure* pricing from purchasing records, were converted to FTE using the following measure: In a low income country, the average salary and overhead expense of 1 FTE working in research information management is approximately USD 25,000. In a high income country, USD 25,000 is equivalent to the average salary and overhead of 0.25 FTE. Therefore, if a cost is presented as 2 FTE, this would roughly translate to USD 50,000 in the low income country and USD 200,000 in the high income country.

Small to large institutions

Institutions needing RIMS solutions are very diverse in size and research information management needs. To reflect this diversity, indicators for costs and value are presented as averages for small and large institutions to highlight the range of scenarios. Small institutions are defined as institutions with 200 or less "research active" staff members. Large institutions are those with 3,000 or more "research active" staff members.

Value

The diversity of institutional characteristics and behaviours also affects how costs are perceived by participants in relation to the value they generate. Participants were asked to indicate differences in value before and after *Pure* for the following measures:

- Amount of time saved for administrative and faculty staff using *Pure* as compared to their DIY solution,
- Amount of overall added value gained from using *Pure* as compared to their DIY solution, and
- Preferences for buying or building, in four areas:
    - Buying vs. Building (general preference)
    - Off-the-shelf vs. Customisation (flexibility to meet individual needs)

- Cloud hosting by Elsevier vs. Hosting locally (perception of ownership and data security)
- External vs. Internal technical support (staff dependency and knowledge).

Regarding preferences, participants were asked to recall the time before they decided to move to *Pure* and indicate which aspects they would have preferred at that time. Participants were then asked what their preferences were today, after implementing *Pure*. The changes in preference after experience with *Pure* (e.g., more in favour of buying) was a useful indicator of value for money and enables a general ROI estimation based on value. These value measures were also used to derive estimates for DIY operations staff costs and opportunity costs (see Derived estimates below).

Derived estimates

Two types of costs for DIY solutions were derived from other data: administrator and faculty operational costs and opportunity costs.

Administrator and faculty staff operational costs for DIY solutions were not assessed directly, as most participants had not used a DIY solution for some time. Instead, participants were asked to estimate how much staff time was saved with *Pure* compared to DIY. Participants indicated that administrators saved about 20-30% of their time and faculty saved about 10-20% with *Pure*. Therefore, approximate DIY operations staff costs can be derived using proportions based on savings estimates.

DIY operational staff costs were derived by using the most conservative estimates of reported staff time savings with *Pure* over DIY for administrators (20% less than DIY) and faculty (10% less than DIY). For example, DIY administrator cost is equal to *Pure* administrator cost divided by 0.8 as illustrated below:

1. *Pure costs = 80% of DIY* (20% less than DIY)
2. *Pure costs = 0.8 x DIY*
3. DIY = *Pure* costs / 0.8

This conversative estimate suggests that DIY solutions require operational staff costs of at least 2.3 FTE for small institutions and 27.2 FTE for large institutions, as shown in Table 2.

Table 2. Administrative and faculty staff costs

Total cost of ownership (TCO)	Build (DIY)	Buy *(Pure)*
Administrator time	(*Pure* / 0.8)	
Small institution	0.6 FTE	0.5 FTE
Large institution	5.0 FTE	4.0 FTE
Faculty time	(*Pure* / 0.9)	
Small institution	1.7 FTE	1.5 FTE
Large institution	22.2 FTE	20.0 FTE
Total operations staff costs		
Small institution	2.3 FTE	2.0 FTE
Large institution	27.2 FTE	24.0 FTE

Opportunity cost estimates (unavailable or lost value, e.g., public research profile, reporting & analytics capabilities, increased collaborations, better research performance, more grant funding) were derived using participant estimates comparing value between *Pure* to DIY solutions.

Participants indicated that *Pure* provided 70% more value than DIY solutions, on average (see Annual opportunity costs below for detail). Using this proportion of added value (70%), the value unavailable/lost to a DIY solution was calculated in three steps.

1. **Assign DIY value.** The most conservative value of a DIY solution was considered to be equivalent to one year of annual costs. The specific value of an actual DIY solution is likely to be much more, but it was assumed that any solution must generate at least as much overall value as it costs to run. Therefore, one year of annual costs were used as a minimum DIY value.
2. **Calculate *Pure* value.** Using the 70% greater value proportion (0.7) for *Pure*, reported by survey participants, calculation is simple: *Pure* value = DIY value x 1.7.
3. **Determine DIY opportunity cost (unavailable/ lost value).** *Pure* value – DIY value = unavailable/ lost value (opportunity cost with DIY solution).

4

COSTS & VALUE

4. COSTS & VALUE

One-time costs for a RIMS solution include software license fees and implementation costs. These costs come in many combinations of fees to providers and internally borne costs for DIY and commercial solutions.

4.1 Overview: TCO, Value and ROI

Pure shows a clear advantage in TCO when compared to DIY solutions, as shown in Table 3. For small institutions, the DIY TCO is approximately 6.5 FTE while *Pure* TCO is 4.7 FTE. For large institutions, the TCO advantage for *Pure* is even more significant: 55.6 FTE for DIY compared to 32.6 FTE for *Pure*.

The TCO advantage for *Pure* is especially significant given that estimates for DIY internal software development costs could not be included due to their extreme variability (see One-time costs section below). However, even prior to adding an appropriate amount for these costs, the TCO for *Pure* is approximately 27% less than DIY for small institutions and 41% less for large institutions.

Table 3. Total cost of ownership (TCO) comparison for first year

Total cost of ownership (TCO)	Build (DIY)	Buy *(Pure)*
One-time costs		
Small institution	variable*	2.5 FTE
Large institution	variable*	8.0 FTE
Annual operational costs (1 year)		
Small institution	3.8 FTE	2.2 FTE
Large institution	32.7 FTE	24.6 FTE
Annual opportunity costs (1 year)		
Small institution	2.7 FTE	0.0 FTE
Large institution	22.9 FTE	0.0 FTE
Total cost of ownership (TCO)		
Small institution	6.5 FTE*	4.7 FTE
Large institution	55.6 FTE*	32.6 FTE

Note: Small institution: ≤ 200 research active staff members. Large institution: ≥3000 research active staff members.
* Data for internal software development too variable to include. Actual TCO will be higher. Use RIMS TCO Calculator to compare using custom local estimates.

All participants in the investigation indicated that *Pure* provided more value to their institution than their previous solution (usually DIY). The overall added value of *Pure* ranged from 40% more to 100% more, averaging around 70% more value from *Pure* (see Figure 4).

Using this value measure for *Pure*, it is possible to generate rough indicators for minimum return on investment (ROI) (see Table 4).

Figure 4. The average added value of Pure

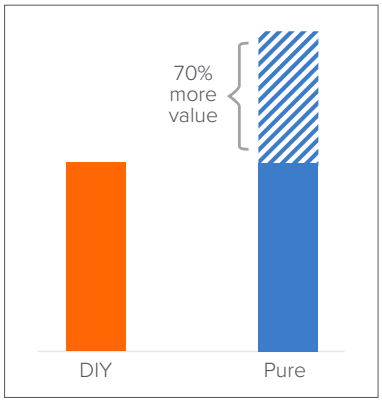


Table 4. DIY / Pure Return on investment (ROI) comparison (1 year)

Total cost of ownership (TCO)	Build (DIY)	Buy *(Pure)*
Value		
Small institution	3.8 FTE	6.5 FTE
Large institution	32.7 FTE	55.6 FTE
Total cost of ownership (TCO)		
Small institution	6.5 FTE*	4.7 FTE
Large institution	55.6 FTE *	32.6 FTE
Return on investment (ROI)		
Small institution	-56%	37%
Large institution	-70%	71%

Note: Small institution: ≤ 200 research active staff members. Large institution: ≥3000 research active staff members.
* Data for internal software development too variable to include. Actual TCO will be higher. Use RIMS TCO Calculator to compare using custom local estimates.

After one year, *Pure* generates a 37% percent ROI for small institutions and a 71% ROI for large institutions. DIY, on the other hand, generates a -56% ROI (loss on investment) for small institutions and a -70% ROI for large institutions. This loss reflects, in part, the value that is unavailable to DIY solutions that they would otherwise get with *Pure* (included in the TCO as opportunity costs).

The sections below provide detail for each category of costs and value.

4.2 One-time costs

One-time costs for a RIMS solution include software license fees and implementation costs. These costs come in many combinations of provider fees and internally borne costs for DIY and commercial solutions.

Section highlights

One-time costs: **DIY:** Variable ***Pure*:** 2.5 – 8 FTE

- DIY solutions do not pay any "end-product" software license fees to any provider, though they often purchase components to assist with development. Implementation costs (including software development) are too variable to estimate. *(Note: Ongoing technical support and maintenance are operational costs.)*
- *Pure* one-time software license costs are in the range of 1 – 3 FTEs, with implementation costs ranging from 1.3 – 2.5 FTEs.

See Methodology for detail on the FTE common metric. Ranges represent estimates for small institutions (≤ 200 research active staff members) to large institutions (≥3000 research active staff members).

Estimates for one-time costs (e.g., software license, implementation costs) were based on survey responses, interviews, and review of *Pure* purchase records. Most institutions had initially implemented *Pure* as a locally-hosted solution and paid a one-time software license fee for *Pure*. Today *Pure* is offered as a cloud-hosted Software-as-a-Service (SaaS) solution to new clients, covered by a subscription fee (see Annual costs). Many *Pure* institutions, who previously chose the locally-hosted option, are moving to the cloud hosted and managed option.

4.2.1 Purchased software

One-time software costs for commercial solutions consist of licenses fees paid to providers for installation of software on local networks. Ongoing activities to develop new features or provide technical assistance to fix bugs or update security protocols are included annual subscription fees *(Pure)* or support and maintenance costs (DIY).

DIY purchased software costs

DIY solutions, by nature, do not pay one-time "end product" software license fees to a provider. However, institutions developing DIY solutions may purchase third-party software to use as components of a larger solution or to assist with development processes. These types of DIY software costs were not assessed due to the extreme variability of scenarios, but the RIMS TCO Calculator enables institutions to include these costs as applicable to their specific scenarios.

Internal software development costs for DIY (e.g., information technology (IT) staff time) are designated as implementation costs.

Pure purchased software costs

Pure's one-time license costs ranged from 1 – 3 FTEs. The actual costs described by participants varied widely depending on the scale of the institution, the economy in the institution's country and the scope of modules implemented.

The pricing for *Pure* is tiered, based on anticipated volume of use, national economic status and the number of *Pure* modules implemented. Anticipated volume of use is determined by the number of "currently research active" staff. Smaller institutions therefore pay less than larger institutions. Institutions from low income countries pay less than those from high income countries. In addition, institutions pay only for those modules they plan to use. For example, some institutions purchase only the Core module and the *Pure* Portal module, whereas others purchase workflow-specific modules related to reporting, research grants, CV management, research community development or national assessment support. Naturally, the scope of modules purchased affected each institution's one-time license cost.

4.2.2 Implementation costs

Implementation costs refer to the cost of activities required to get the solution fully operational. Activities include configuration of the solution to match institutional conditions, integration with other systems, data migration, testing and preparation for rolling out the new solution into relevant workflows throughout the institution.

For DIY solutions, implementation costs include all the internal staff time to develop the solution. Commercial solutions usually charge one-time implementation fees which are higher if an optional implementation project manager from the provider is engaged.

All RIMS solutions require administrative team resources for coordinating relationships between relevant departments, facilitating data migration and workflow transitions and ensuring that the solution developed adequately meets the institutional requirements. Administrative teams also manage rollout plans, including scheduling, communication and initial training.

DIY implementation costs (including software development)

Internal software development costs for DIY solutions are extremely variable. Institutional IT development strategies can range from writing code from scratch to combining and integrating various off-the-shelf software components. The IT teams must integrate the solution with other institutional systems and test for operational effectiveness as well as the ability to meet the functional requirements. Factors affecting cost include IT staff competency, development approach, complexity of integration with other systems, institutional functional requirements, regional reporting requirements and the size of institution. The corresponding range in costs (thousands to millions) makes reasonable comparison too difficult.

For the most relevant comparisons, institutions are strongly encouraged to use the RIMS TCO Calculator. The calculator enables institutions to include precise and detailed costs estimates, including software development and implementation, to generate a customised TCO and ROI comparison.

Pure implementation costs

Pure implementation fees, paid to Elsevier, ranged from 0.3 – 2.5 FTE, depending on the size of the institution and the scope of the implementation.

Implementation fees for *Pure* vary significantly depending on the scope of modules purchased, the number of integrations with other systems required and the data migrations needed. These fees ranged from less than 0.3 FTE to about 2.5 FTEs, depending on the scope, and included one or more of the services outlined below.

- Required implementation fee for Elsevier to set up a unique instance of *Pure* and provide standard orientation and training of institution administrators.
- Optional implementation consulting services from Elsevier include:
    - Guidance from a dedicated first year launch project manager who advises the institution on configuration choices and helps the internal project manager organise the rollout of *Pure* in their institution,
    - Setup of direct integrations with other institutional systems (e.g., login server, human resources, registrar, institutional repository, grants management),
    - Preparation of publicly available faculty data for use in *Pure* through the Profile Refinement Service (PRS).

Internal resources required from institutions averaged 2 – 3 FTEs for 10-12 months (2.5 FTE on an annual basis) for large institutions, while more standard implementations for smaller institutions required 2 – 3 FTEs for 4-6 months (1.3 FTE on an annual basis).

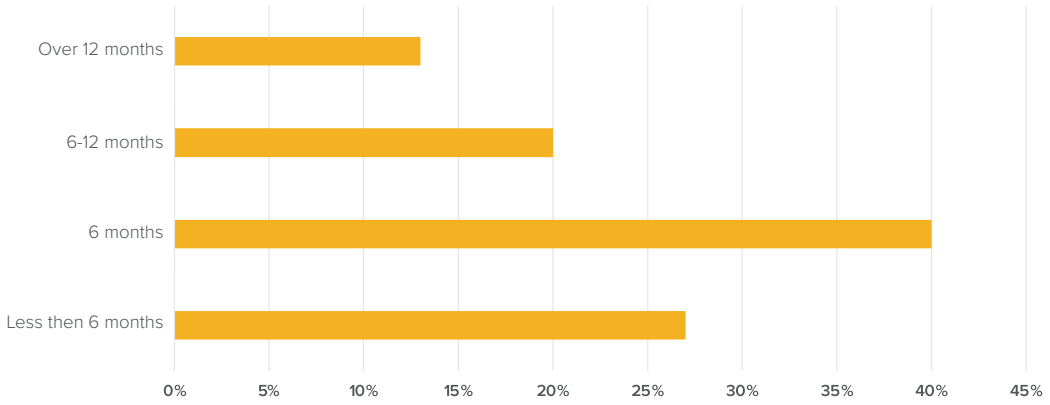
Resource requirements for institutions implementing *Pure* with no system in place were somewhat larger as they often took longer. These institutions were very few as almost all institutions had some system in place to manage some aspects of research information before *Pure* was implemented.

For institutions that had DIY solutions in place before implementing *Pure*, the types of solutions ranged from having very basic solutions based on spreadsheets, SharePoint or a simple database, to more custom-built solutions coded and developed by the internal IT department from scratch or based on open source or third-party components. It is not possible to draw any clear conclusions on how much more or less the resource requirement was for these institutions, but there is an indication that the more complex the existing solution, the longer the implementation time frame.

How long does *Pure* implementation take?

Institutions reported *Pure* implementation times ranging from 1 month to over 18 months. 27% were completed in less than 6 months, 40% took about 6 months, 20% took between 6 and 12 months, and another 13% reported implementation times of longer than 12 months (see Figure 5).

Figure 5. Distribution of Pure implementation times



* Data for internal software development too variable to include. Actual TCO will be higher. Use RIMS TCO Calculator to compare using custom local estimates.

A typical implementation of *Pure* takes 10-12 months for large institutions using several modules and requiring integrations with other systems. Smaller implementations of *Pure* can be finalised within 3 months. When institutions were prepared in advance of implementing *Pure* (dedicated team with authority and productive workflows in place), and there were no technical problems with data migration or system integration, the time frame was typically in the range of 4-6 months from project kick-off to “go live”.

4.2.3 Total one-time costs

Data for one-time costs for DIY solutions are extremely variable and complex and require custom review. One-time costs for *Pure* ranged from 2.5 FTE for small institutions to 8.0 FTE for large institutions (see Table 5).

* Data for internal software development too variable to include. Actual TCO will be higher. Use RIMS TCO Calculator to compare using custom local estimates.

Table 5. One-time costs

One-time costs	Build (DIY)	Buy *(Pure)*
Purchased software		
Small institution	0.0	1.0 FTE
Large institution	0.0	3.0 FTE
Implementation / development		
Small institution	variable*	1.5 FTE
Large institution	variable*	5.0 FTE
Total one-time costs		
Small institution	variable*	2.5 FTE
Large institution	variable*	8.0 FTE

Note: Small institution: ≤ 200 research active staff members. Large institution: ≥3000 research active staff members.
* Data for internal software development too variable to include. Actual TCO will be higher. Use RIMS TCO Calculator to compare using custom local estimates.

4.3 Annual operational costs

Operational costs include staff resources for administrative personnel and faculty end users. For a DIY or *Pure* locally hosted scenario, staff and direct financial costs may be incurred for infrastructure (e.g., hosting, backups, data security). DIY solutions also have technical support and maintenance costs.

Section highlights

Annual operational costs: **DIY:** 3.8 – 32.7 FTE ***Pure*:** 2.2 – 24.6 FTE

- Operational costs for continuous development and support & maintenance for *Pure* (most covered by the subscription fee) are approximately 0.2 – 0.6 FTE annually.
- For DIY solutions, internal infrastructure costs are approximately 0.5 FTE for small institutions and 2.5 FTE for larger institutions. Support & maintenance costs are about 1 FTE for small institutions and 3 FTE for larger institutions.
- The costs for operational staff (administrators and faculty) are largely dependent on the scope of the system and size of the institution and range as follows:
  - 0.6 FTE for administrative staff and 1.7 FTE for faculty members for smaller institutions, and
  - 5.0 FTE for administrative staff and around 22.2 FTE for faculty members for larger institutions.

See Methodology for detail on the FTE common metric. Ranges represent estimates for small institutions (≤ 200 research active staff members) to large institutions (≥3000 research active staff members).

4.3.1 Infrastructure costs

Infrastructure costs include tools and activities to maintain the integrity of the solution, including the proper maintenance of hardware, systems software, database software, and related tools as well as the management of hosting, backups, and data security.

DIY infrastructure costs

Infrastructure costs for DIY solutions can be estimated rather well, as many institutions implemented *Pure* with local hosting and costs would be similar for DIY. For smaller institutions the costs are around 0.5 FTE, as a combination of financial costs and staff resources from the information technology (IT) department, and about 2.5 FTE for larger institutions.

Pure infrastructure costs

Infrastructure costs for *Pure* are included below in support & maintenance costs / subscription fee.

4.3.2 Support & maintenance costs

Support and maintenance costs include technical maintenance of the solution (e.g., bug fixes, security updates), support to users (e.g., help desk, training), and ongoing development of new features.

DIY support & maintenance costs

The support & maintenance costs for DIY solutions are difficult to assess, as they vary greatly depending on the system. However, even for basic DIY solutions it is rare to have less than 1 FTE assigned to the solutions' continuous development. Dependency on a single individual is risky, and additional resources are usually preferred, especially for larger institutions. Indications are that 3 FTE would be a modest expectation for keeping a DIY solution fully supported and maintained.

Pure support & maintenance costs / subscription fee

Support and maintenance costs for *Pure* ranged from 0.2 – 0.6 FTE (small to large institutions). For institutions hosting *Pure* locally, this included internal costs as well as fees paid to Elsevier.

Institutions pay an annual subscription fee to Elsevier to cover ongoing service for *Pure*, including bug fixes, continuous development of new functionality and general user support. Subscription fees are typically 15-20% of the one-time license cost. When an institution hosts their *Pure* installation with Elsevier instead of local hosting, the subscription fee then includes all infrastructure costs.

4.3.3 Operations staff costs

The staff resources required for RIMS management and data handling vary greatly depending on the scope of the solution and the size of the institution. Both administrative staff and faculty engage with *Pure* in different degrees depending on local policies and preferences.DIY operations staff costs

Administrator and faculty staff operational costs for DIY solutions were not assessed directly, as most participants had not used a DIY solution for some time. Instead, participants were asked to estimate how much staff time was saved with *Pure* compared to DIY. Participants indicated that administrators saved about 20-30% of their time and faculty saved about 10-20% with *Pure*. Therefore, approximate DIY operations staff costs can be derived using proportions based on savings estimates.

DIY operational staff costs were derived by using the most conservative estimates of reported staff time savings with *Pure* over DIY for administrators (20% less than DIY) and faculty (10% less than DIY). For example, DIY administrator cost is equal to *Pure* administrator cost divided by 0.8 as illustrated below:

1. *Pure costs = 80% of DIY (20% less than DIY)*
2. *Pure costs = 0.8 x DIY*
3. *DIY = Pure costs / 0.8*

This conversative estimate suggests that DIY solutions require operational staff costs of at least 2.3 FTE for small institutions and 27.2 FTE for large institutions, as shown in Table 6.

Table 6. Administrative and faculty staff costs

One-time costs	Build (DIY)	Buy *(Pure)*
Administrator time	(*Pure* / 0.8)	
Small institution	0.6 FTE	0.5 FTE
Large institution	5.0 FTE	4.0 FTE
Faculty time	(*Pure* / 0.9)	
Small institution	1.7 FTE	1.5 FTE
Large institution	22.2 FTE	20.0 FTE
Total operations staff costs		
Small institution	2.3 FTE	2.0 FTE
Large institution	27.2 FTE	24.0 FTE

Pure operations staff costs

Administrative staff usually are centrally located and provide services to the entire institution, including end user support, technical support and content management. For some institutions, they are involved directly in data handling, including entry (on behalf of faculty members) and/or validation. In some cases, department-level administrators assume some of these roles, especially data handling. For smaller institutions with a narrow scope, administrative staff costs are estimated at about 0.5 FTE, whereas costs for larger institutions with a full scope of services are on average at about 4 FTEs.

Faculty researchers engage with *Pure* at different levels. Some institutions require research staff to enter research information into *Pure* themselves. In other cases, data entry is handled by administrators, while faculty primarily focus on validating data entered by others. The number of faculty users can range from a few hundred to several thousand. The overall estimated time spent by faculty members using *Pure* ranges from virtually nothing to a few hours per month or more hours concentrated once or twice per year. On average, faculty members spend about 1 hour per month working with *Pure*. This translates to about 1.5 FTE for small institutions and over 20 FTEs for large institutions.

4.3.4 Total annual operational costs

Total annual operational costs for DIY solutions ranged from 3.8 – 32.7 FTE. *Pure* costs ranged from 2.2 FTE for small institutions to 24.6 FTE for large institutions (see Table 7).

Table 7. Annual operational costs

Annual operational costs	Build (DIY)	Buy *(Pure)*
Infrastructure		
Small institution	0.5 FTE	0.0 FTE
Large institution	2.5 FTE	0.0 FTE
Support & maintenance ("subscription fee" with *Pure*)		
Small institution	1.0 FTE	0.2 FTE
Large institution	3.0 FTE	0.6 FTE
Operations staff	(*Pure* / 0.8)	
Small institution	2.3 FTE	2.0 FTE
Large institution	27.2 FTE	24.0 FTE
Total annual operational costs		
Small institution	3.8 FTE	2.2 FTE
Large institution	32.7 FTE	24.6 FTE

Note: Small institution: ≤ 200 research active staff members. Large institution: ≥3000 research active staff members.

4.4 Annual opportunity costs

Opportunity costs represent lost value or missing functionality. DIY solutions often don't benefit from the sophisticated integration or continuous development of commercial systems. A more accurate TCO comparison can be made by calculating this lost value as a cost.

Section highlights

Annual opportunity costs: **DIY:** 2.7 – 22.9 FTE ***Pure*:** 0 FTE

- Participants indicated that *Pure* provided, on average, 70% more value than the previous solution. Institutions with DIY solutions are missing out on this added value they would otherwise receive with *Pure*.
- The 70% added value with *Pure* translates into opportunity costs for DIY solutions (the cost of value unavailable or "lost" by not using *Pure*) ranging from 2.7 – 22.9 FTE.

See Methodology for detail on the FTE common metric. Ranges represent estimates for small institutions (≤ 200 research active staff members) to large institutions (≥3000 research active staff members).

To assess the overall value of using *Pure* compared to previous RIMS solutions (usually DIY solutions), participants were asked to indicate the value added for their institution from using *Pure*. These value assessments provide useful indicators that can be leveraged to estimate the value these institutions were missing out on with their DIY solutions (opportunity costs).

The overall added value of *Pure* compared to the institution's previous system was high, ranging from 40% to 100% and averaging around 70% more value from *Pure*.

Using this proportion of added value, the opportunity cost (value unavailable/lost) for a DIY solution was calculated in three steps.

1. **Assign DIY value.** The most conservative value of a DIY solution was considered to be equivalent to one year of annual costs. The specific value of an actual DIY solution is likely to be more, but it was assumed that any solution must generate at least as much overall value as it costs to operate. Therefore, one year of annual costs was used as a minimum DIY value.
2. **Calculate *Pure* value.** Using the 70% added value proportion (0.7) for *Pure*, reported by survey participants, the *Pure* value becomes a simple calculation: *Pure* value = DIY value x 1.7.
3. **Determine DIY opportunity cost (unavailable/ lost value).** *Pure* value – DIY value = DIY opportunity cost.

Based on the one-time and annual operating costs described in previous sections, minimum opportunity costs for DIY ranged from 2.7 – 22.9 FTE (see Table 8).

Table 8. Opportunity costs

Opportunity costs	Build (DIY)	Buy *(Pure)*
Unavailable/lost value		
Small institution	2.7 FTE	0.0 FTE
Large institution	22.9 FTE	0.0 FTE

Note: Small institution: ≤ 200 research active staff members. Large institution: ≥3000 research active staff members.

DIY risks and additional opportunity costs

There are a variety of risks associated with DIY solutions that should also be carefully assessed by institutions. The financial impact of a failure or loss associated with each risk area also should be included in opportunity costs. Risk areas where failure is most common for any DIY technology solution, and which have been reported by *Pure* clients with previous DIY RIMS experiences, include:

- **Time to market:** Internal development of a new and custom technology solution often takes longer than expected.
- **Deployment failure:** In some cases, the internally developed solution is never deployed.
- **Compliance:** In other cases, the solution does not fully or adequately comply with the functionality needed by the institution.

These risks, and the significant costs associated with them, are too variable to be estimated for this whitepaper. Institutions are strongly encouraged to carefully assess these risks, quantify them as costs and include them in opportunity costs when using the RIMS TCO Calculator.

Similar risks are also relevant for commercial RIMS products, including *Pure*, but the degree of risk is much lower than for DIY solutions. For example, *Pure* has a long history of use and development that has made it a stable product that is much more predictable and reliable than new and internally developed solutions.

4.5 Overall value and preferences to build or buy

On average, participants felt that *Pure* provided 70% more value than their previous solution (mostly DIY). When asked to indicate how their preference for buying or building a RIMS solution changed after moving to *Pure*, all preferred buying over building even more once they had experience with *Pure*.

Section highlights

Added value of *Pure*: 70% more value than DIY
Preference when DIY users: Preferred buying 39% more than building
Preference when *Pure* users: Preferred buying 58% more than building

- Institutions estimated the added value of *Pure* from 40% to 100% higher than DIY (average of 70%).
- Institutions would rather buy than build, even when they were using a DIY solution.
- Once an institution moved from DIY to *Pure*, the strength of their preference for buying increased by almost 50%.

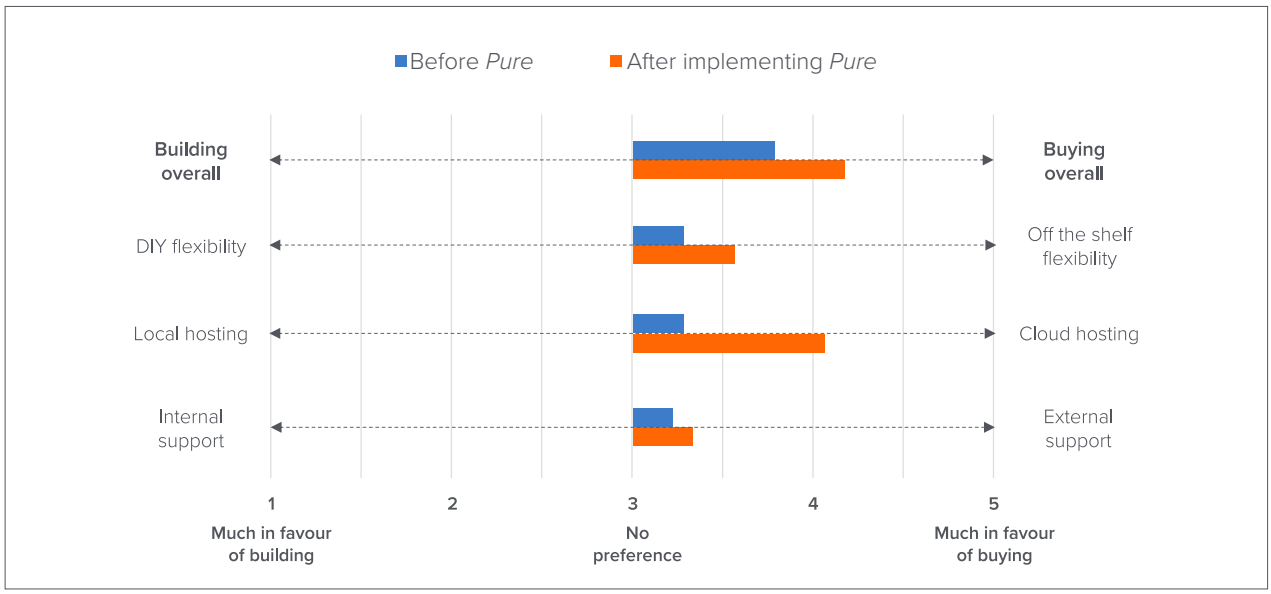
All participants indicated that *Pure* delivered more value to their institution than their previous solution (usually DIY). The overall added value of *Pure* ranged from 40% more to 100% more, averaging around 70% more value from *Pure*.

Regarding preferences, respondents were asked to recall the time before they decided to move to *Pure* and indicate which aspects they would have preferred at that time. Respondents were then asked what their preferences were today, after implementing *Pure*. Preferences were indicated at an overall level and for three aspects reflecting common debates about buying versus building a RIMS solution:

- Buying vs. Building (general preference)
- Off-the-shelf vs. Customisation (flexibility to meet individual needs)
- Cloud hosting by Elsevier vs. Hosting locally (perception of ownership and data security)
- External vs. Internal technical support (staff dependency and knowledge)

For the specific aspects, institutions had a light preference for buying rather than building even before selecting *Pure*, and this preference became more prominent once *Pure* had been implemented (see Figure 6). Almost all institutions had a DIY solution before the selection of *Pure*.

Figure 6. Preferences for buying over building



Note: Participant perspectives on value and preference were roughly the same globally, with a somewhat stronger trend towards commercial solutions in North America and Europe.

Some of these increases in strength of preference may be partly due to general trends over time towards commercial solutions. The most prominent example is the significant increase in preference for cloud hosting today. This runs parallel to the increase in overall acceptance and popularity of cloud hosting over time. Almost any type of system today is hosted in the cloud and provided as a Software-as-a-Service (SaaS) rather than as an individual installation locally, often because cloud hosting means significantly lower costs as hosting organisations can leverage economies of scale.

TCO and ROI comparisons for DIY and *Pure* are provided in the next section.

5

RIMS TCO CALCULATOR

5. RIMS TCO CALCULATOR

Using cost estimates based on institutional experience, it is possible to provide a rough indication of the TCO and ROI for both for DIY solutions and *Pure*. The comparison suggests a clear advantage for *Pure*. Institutions are encouraged to use the RIMS TCO Calculator tool to make comparisons with customised local estimates.

5.1 Total cost of ownership (TCO) comparison

Table 9 below shows all the estimated costs based on the calculations presented in the costs and value section above.

Table 9. DIY / Pure total cost of ownership (TCO) comparison

Total cost of ownership (TCO) – 1 Year	Build (DIY)	Buy *(Pure)*
One-time costs		
Purchased software		
Small institution	0.0	1.0 FTE
Large institution	0.0	3.0 FTE
Implementation / development		
Small institution	variable*	1.5 FTE
Large institution	variable*	5.0 FTE
Total one-time costs		
Small institution	**variable***	**2.5 FTE**
Large institution	**variable***	**8.0 FTE**
Annual operational costs		
Infrastructure		
Small institution	0.5 FTE	0.0 FTE
Large institution	2.5 FTE	0.0 FTE
Support & maintenance ("subscription fee" with *Pure*)		
Small institution	1.0 FTE	0.2 FTE
Large institution	3.0 FTE	0.6 FTE
Operations staff		
Small institution	2.3 FTE	2.0 FTE
Large institution	27.2 FTE	24.0 FTE
Total annual operational costs		
Small institution	**3.8 FTE**	**2.2 FTE**
Large institution	**32.7 FTE**	**24.6 FTE**
Annual opportunity costs		
Small institution	**2.7 FTE**	**0.0 FTE**
Large institution	**22.9 FTE**	**0.0 FTE**
Annual opportunity costs		
Small institution	**6.4 FTE**	**4.7 FTE**
Large institution	**55.6 FTE**	**32.6 FTE**

Note: Small institution: ≤ 200 research active staff members. Large institution: ≥3000 research active staff members.
* Data for internal software development too variable to include. Actual TCO will be higher. Use RIMS TCO Calculator to compare using custom local estimates.

5.2 Return on investment (ROI) comparison

The return on investment (ROI) measure is usually reserved for investments that generate revenue. However, the basic calculation, usually expressed as a percentage of the original investment returned as additional value (ROI = Value - Investment/Investment), can provide an indicator of return in value for a RIMS in relation to the costs expended.

Using the most conservative estimate of DIY value (equal to annual operational costs, see section 4.4), general indicators for ROI show *Pure* generating strong ROI after 1 year: 37% percent ROI for small institutions and 71% ROI for large institutions (see Table 10). DIY shows negative returns (loss on investment) of -56% ROI for small institutions and -70% ROI for large institutions. This loss reflects, in part, the fact that DIY solutions do not benefit from this added value that is available to *Pure* users (opportunity cost).

Table 10. DIY / Pure Return on investment (ROI) comparison (1 year)

	Build (DIY)	Buy *(Pure)*
Value		
Small institution	3.8 FTE	6.5 FTE
Large institution	32.7 FTE	55.6 FTE
Total cost of ownership (TCO)		
Small institution	6.5 FTE*	4.7 FTE
Large institution	55.6 FTE*	32.6 FTE
Return on investment (ROI)		
Small institution	-56%	37%
Large institution	-70%	71%

Note: Small institution: ≤ 200 research active staff members. Large institution: ≥3000 research active staff members.
** Data for internal software development too variable to include. Actual TCO will be higher. Use RIMS TCO Calculator to compare using custom local estimates.

5.2.1 Importance of quantifying value for DIY

It is likely that DIY solutions can return more value than their annual costs (the minimum value used in the above comparison), which will increase ROI. However, it is also essential to add locally estimated DIY software development costs, which often increases TCO by significant amounts thus reducing ROI.

Value can be difficult to quantify, but it is essential that institutions make careful estimates of anticipated staff time savings, increases in funding, or related value they expect from their DIY RIMS. Otherwise, they will not be able to determine if a DIY solution has a chance of providing more value than it costs. Institutions must then be sure their DIY RIMS is designed with the functionality necessary for achieving those value targets and estimate the software development costs accordingly. (See example in box.)

Entering these estimates into the RIMS TCO Calculator, along with annual costs, will provide institutions with a reasonable indication if the DIY exercise will be worth it.

Example of determining added value required from a DIY RIMS

In order for DIY ROI to rise above 0% ROI, the value of the DIY solution must be more than the TCO (including real software and development implementation cost estimates). For example, if a large institution estimates its real RIMS software development and implementation costs to be 5 FTE, the TCO from the comparison table above would rise to 60.6 FTE. This would mean that the total value of the DIY solution must be more than 60.6 FTE to start generating any ROI (27.9 FTE more than the annual operational costs of 32.7 FTE).

ROI formulas & requirements

- ROI = Value – TCO/TCO
- Break-even ROI (0%): Value equal to TCO
- Positive ROI (>0%): Value greater than TCO

Sample break-even value determination, using current DIY estimates for large institution

1. Current TCO + implementation costs (software development) = new TCO
   55.6 + 3 = 60.6
2. Break-even value = TCO
   Break-even value = 60.6* (value required to break even); more value required for ROI
   * 27.9 FTE more than average estimated annual costs

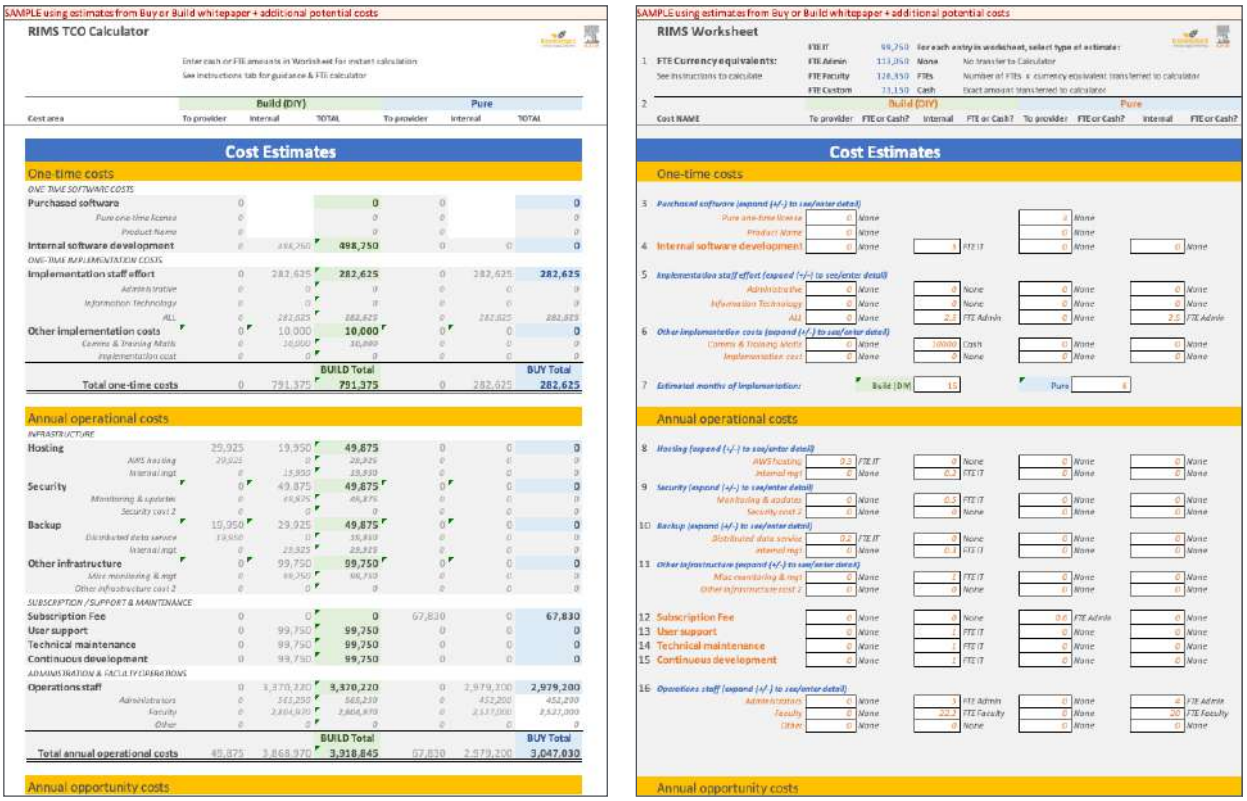
In this rough example, the fictional institution should be reasonably sure that their new DIY RIMS would generate at least 60.6 full-time staff members worth of value before embarking on the effort.

5.3 RIMS TCO Calculator

The RIMS TCO Calculator is available as an Excel file through regional Elsevier representatives. Institutions enter real cost and value estimates for two RIMS solutions into a worksheet, as either cash or FTE amounts. The RIMS TCO Calculator presents the TCO and ROI comparisons for all cost areas and recalculates instantly to reflect changes in estimates in the worksheet.

A snapshot of the RIMS TCO Calculator is presented in Figure 7. Contact your regional Elsevier representative to access the RIMS TCO calculator or refer to the contact details on page 2 of the whitepaper.

Figure 7. RIMS TCO Calculator snapshot



6 CASE STUDIES

6. CASE STUDIES

A number of case studies have been developed, based on the interviews, to provide context for the TCO and ROI indicators emerging from the investigation. These stories highlight examples of real experiences in diverse institutions that replaced local DIY solutions with *Pure*. Each case study includes a short introduction about the university along with a background of what solution was in place before *Pure* was implemented and the main reasons driving the change. The overall implementation process and ensuing operational conditions are described, followed by specific results and lessons learned.

6.1 University of Copenhagen, Denmark

As one of the first institutions to implement *Pure*, the University of Copenhagen (UCPH) has leveraged its long history of engagement with the Danish *Pure* User Group and *Pure* to influence the development roadmap.

Background

The University of Copenhagen (UCPH) was founded in 1479 and is one of the largest and oldest universities in Europe. They employ over 10,000 staff, over half of whom are researchers. The university produces over 8,500 publications every year.

UCPH was among the first universities to implement *Pure*, back in the early 2000s. One of the key drivers for getting a proper CRIS/RIMS was the introduction in Denmark of the Bibliometric Research Indicator (BFI; “forskning” is Danish for “research”), a national system for allocating research funding to Danish universities based on research output. The requirements involve tracking publications in three categories of journals and reporting to the national system. This can be a complicated and time-consuming process to manage. *Pure* was able to automate much of the work, including integrated reporting to the national system, thus saving UCPH money and reducing errors.

UCPH also wanted a research portal to make the university’s researcher profiles accessible to a global audience. The increased visibility of research results and researchers provided by the *Pure* portal was expected to facilitate increased collaborations within the university and with external partners. These collaborations, in turn, would attract more research funding and further increase research output.

Implementation & Operation

The implementation of *Pure* took approximately 10-12 months. Overall, about 10-15 FTEs were involved in the implementation of *Pure*. A significant effort went into a customised approach for the *Pure* Portal, integrating it with the Content Management System (CMS) behind university’s website.

Another reason for the substantial internal resources required for implementation was that the university is very decentralized. For the first time, many different institutes and departments (e.g., library and research office) had to work together, coordinate activities and take joint decisions.

Today, approximately 15 FTE administrators provide support for *Pure*, including roles responsible for adding and validating content.

Results & Lessons learned

The UCPH has a long history of working with *Pure* and was one of the very first institutions to implement it. Many lessons have been learned by both the university and the provider, and these lessons have been leveraged through the years to generate improvements and guide successful implementations of additional modules. Because UCPH has such a long history with *Pure*, and Denmark has such a large and experienced *Pure* User Group (*Pure* was originally developed in Denmark), many of the more recent lessons learned reflect sophisticated *Pure* integration and usage behaviour at a large university.

- **Hosting in the cloud as a provider-managed service is significantly more cost-effective.** At the time of the original implementation, the standard was to host *Pure* locally at the university. UCPH is now moving towards a switch to the cloud-hosted and managed service to reduce infrastructure costs.
- **Two-way integration (read-write) with *Pure* is valuable for increased flexibility.** The *Pure* API for integrating with local systems has traditionally supported reading data out of *Pure* to feed into other systems. UCPH determined that it could further reduce its TCO if it could automate the writing of data into *Pure* as well. The recent release of the *Pure* Write API is therefore most welcome as it supports the possibility to auto-populate *Pure* from other local systems and thus reduce the manual work for data entry and validation.
- ***Pure User Groups* are valuable for sharing best practices and for influencing provider development priorities.** As one of the first institutions to implement *Pure*, the UCPH has been active in the Danish *Pure* User Group for many years. Coordinated communication and advocacy by the large number of *Pure* users has enabled the user group to influence the development roadmap for *Pure*. As *Pure* market coverage has grown substantially, especially since Elsevier acquired *Pure* from Atira (the original Danish developer), it has become more difficult for Elsevier to take individual institutional needs into consideration. However, UCPH remains actively engaged in the Danish *Pure* User Group, working with colleagues to leverage their collective interests to identify development options that balance regional and global priorities.
- **Data re-use between co-authoring institutions can increase efficiency and reduce TCO.** As there are many institutions using *Pure* today, many *Pure* installations include records (e.g., articles) that have been co-authored by researchers at multiple *Pure* institutions. UCPH and colleague institutions recommend that *Pure* facilitate the reuse of data between *Pure* institutions to lower the time for data entry and validation.

6.2 Manipal Academy of Higher Education, India

The Manipal Academy of Higher Education (MAHE) implementation of the *Pure* Portal advanced their progress towards increased international collaboration by making research visible to a global audience. As the first *Pure* installation in India, MAHE anticipated unique challenges but discovered that *Pure* easily met their needs.

Background

Manipal Academy of Higher Education (MAHE), established in 1993, is one of India's leading research institutions and one of the first six universities to recognised as "Institutes of Eminence" by the Government of India. It employs about 10,500 staff, out of which around 2,500 are faculty members. It's fast-growing research output currently totals approximately 2,500 journal articles per year, representing 100% growth over the last three years.

MAHE had developed their own in-house "RMS" solution. The manual data entry required by the system was time consuming and also prone to errors, leading to reports that were not completely trustworthy. Another challenge was that their in-house "RMS" solution was designed for internal purposes and did not allow the university to make their researchers' profiles visible and accessible for potential partners.

In 2017, MAHE decided to implement *Pure* with the aim to address these challenges. In particular, they included the *Pure* Portal, which makes the university's researcher profiles visible along with their publications and other research outputs and activities. *Pure's* tools for automating data import from research information sources like Scopus was also perceived as a key step towards reducing errors and improving the reliability of reports.

> "On a smaller level our home-grown system was fine, but to scale it to all faculty members we needed a solution that could automate the work and ensure data becomes fully trustworthy for reports and our public profiles."
> Santosh K V, Deputy Director Research

Implementation & Operation

The initial focus of the *Pure* implementation was on managing research outputs and activating the *Pure* Portal. This was achieved within about 10 months with an average of 2 FTE managing local implementation activities during that period. After being operational for 2.5 years, MAHE decided in early 2020 to also procure the Awards Management and Reporting modules. Due to the COVID-19 pandemic, the procurement was postponed until early 2021.

To facilitate the regular operation of *Pure*, MAHE maintains an administrative team of 2.5 FTE. These administrators work primarily on entering data into *Pure* on behalf of researchers. More recently, a large number of research coordinators have been trained to take on this task as a more decentralized service, and researchers have started to populate their own profiles. Out of roughly 2,500 researchers in total, there are currently about 800 active users. These users spend an average of 2 hours per month working on *Pure*, though it varies greatly from user to user.

Results & Lessons learned

As the first *Pure* installation in India, MAHE has learned a number of lessons:

- **Home-grown systems lose their viability over time.** One of the first lessons learned was facing the reality that although MAHE had years of experience with building their own internal system, ultimately their home-grown system was no longer a viable option for meeting their needs for management reporting and professional public visibility of their research.
- **Features for international collaboration and visibility are extremely difficult to build into DIY solutions.** International collaborations are of critical importance to MAHE, and the use of the *Pure* Portal is considered the most valuable. This was the main objective of the transition and also the part MAHE is most satisfied about, rating it 10 out of 10.
- **A commercial RIMS can be less flexible in some areas than a DIY solution.** One of the trade-offs for the advantages of implementing *Pure* was learning that it can be less flexible than the home-grown system in accommodating new types of research information. To add some unique types of local content, MAHE needed to repurpose some *Pure* functions for their own needs.
- **Automation of data entry is extremely valuable.** *Pure's* ability to automate some data entry, by importing research outputs from online sources like Scopus and others, is considered a significant positive result of the shift to *Pure*. As the majority of data entered into the DIY solution was done manually, the automation saved time and reduced errors.
- **Sometimes you aren't as unique as you think you are, and it's a good thing.** Over the years, *Pure* has developed country-specific and regional tools, like the module for the Research Assessment Framework (REF) exercises in the UK. MAHE was the first institution in India to implement *Pure*, and it was expected that there might be unique challenges and needs in the Indian context. However, MAHE has learned that their overall challenges in pro-actively managing research information are the same as for any university, and *Pure's* existing functionality works well to meet those needs.

6.3 RTI International, United States of America

RTI International's move from their DIY solution to *Pure* provided the right balance of a stable and reliable solution that also allowed customisation. Partnering a small and empowered internal team with a *Pure* project manager resulted in a smooth and rapid implementation.

Background

RTI International is a US-headquartered research institute founded in 1958 as a collaboration between government, industry and three North Carolina Universities. Today RTI has more than 5,000 worldwide members of staff and produces over 1,000 journal articles annually.

To track its scientific stature, RTI used a home-grown system based on SharePoint and incorporating other databases, including an internal database of employee profiles. This system required extensive administrative resources to maintain and was not meeting the evolving needs at RTI to pro-actively manage their research information, especially regarding research outputs.

RTI had been investigating commercial RIMS solutions for some time by 2016, when they saw a presentation of *Pure*. They quickly concluded that the system was what RTI needed, and a management decision was taken soon after to procure *Pure*.

> "*Pure* is sort of the middle-line of having something that is very stable, well-constructed and works properly at the same time as it allows for a lot of customisation." Bonnie Nelson, Research Librarian

Implementation & Operation

RTI initiated their implementation in June 2016 and went live about 4 months later, using *Pure's* Core Module for managing research outputs. They launched the *Pure* Portal internally and activated an additional feed from *Pure* to RTI's website to make desired information on researchers and their outputs available to the public.

Internally, RTI had a team of 3-4 FTE that worked closely with a project manager from Elsevier throughout the implementation. In addition to from setting up the *Pure* Portal, the implementation included migration of all existing publication data, mostly from the SharePoint system, and researcher profiles and activities from the employee database.

To automate the import of research outputs into *Pure*, RTI uses Web of Science and PubMed as sources. RTI has a long tradition of working with the Web of Science rather than Scopus and valued *Pure's* capabilities to be agnostic with regards to the online sources that are integrated.

For regular operations, RTI has committed 1 FTE for all data import and validation on behalf of the researchers and 0.8 FTE for the overall administration and coordination of the work related to *Pure*. In addition, some editors spend 1-2 days per month working in *Pure*, and another person is engaged from time to time to ensure information on external organisations is kept up to date.

There are about 2,000 active researcher accounts that use *Pure* to add conference contributions, activities, and other items not added by the central team. Research information directly input by researchers is validated by the central team. As *Pure* is used to support the annual awards process, the highest researcher activity in *Pure* is concentrated in December and January, but it averages out to 2-3 hours per researcher per month. This varies greatly depending on unique circumstances. For example, activity intensified when ORCID IDs were added and researchers were required to add or connect their ORCID accounts with their *Pure* account.

Results & Lessons learned

RTI has learned a number of lessons, especially regarding implementation:

- **Home-grown systems require significant resources that are difficult to scale up or expand.** RTI determined that their DIY solution was not viable as a long-term option. The home-grown system required extensive resources internally and couldn't meet the needs for reporting, automated content handling and visibility of researcher profiles.

- **A small, experienced and decisive internal implementation team is essential.** The implementation went very smoothly, and a key factor in that success was the preparation and organisation of the internal project team. Almost all decisions could be taken within the 4-person project team, which ensured a quick turnaround on any topic.
- **An Elsevier project manager helps with a smooth implementation.** RTI decided to engage an Elsevier project manager and felt that the guidance and support provided throughout the process helped leverage best practices and avoid pitfalls.

6.4 Universidad de Monterrey, Mexico

Soon after their decision to pursue a new direction as a research university, the Universidad de Monterrey (UDEM) implemented Pure to efficiently manage their small but rapidly growing research output (~40% increase per year). Dedicated implementation support from Pure was critical for a smooth transition.

Background

The Universidad de Monterrey (UDEM) was founded in Mexico in 1969 as a private educational institution. In 2015, UDEM decided to establish a new direction as a research university and has rapidly expanded their research activities. Today UDEM employs approximately 1,000 academic staff who produce a few hundred publications annually, but this output is increasing by roughly 40% per year.

Compared to the other case studies, UDEM has a rather small number of research active staff and annual research outputs as it received its authorisation as research university in 2015. However, the average growth rate of research outputs is very high, about 40% per year, as is the demand for reports. UDEM quickly realised that they needed a systematic way to manage their research information.

UDEM started out with a very basic DIY solution, characterised an experiment by the internal IT team. The solution was primarily based on spreadsheets stored in the cloud combined with a database. In this configuration, the data often became incorrect and were distributed across numerous spreadsheets, making reporting very challenging. In building a system from scratch, the university had to spend considerable time and resources on specification, implementation and testing, as every detail had to be reviewed. In 2017, UDEM decided to implement *Pure* to achieve more systematic and automated data collection, to ensure higher data quality and reliable reports.

Implementation & Operation

The implementation of *Pure* took about 12 months. Internal staff resources for implementation initially were limited to 0.5 FTE for the first four months but grew to a team of 2.0 FTE, plus 1 FTE from the central administration. The implementation was delayed in its early stages due to communication challenges with the provider's initial implementation lead. The provider replaced the implementation project manager, which smoothed the process, and *Pure* went live in 2018.

> "The implementation lead from the provider is a key resource. They have the experience from many other implementations and enable you to avoid mistakes and take full advantage of *Pure*." David Gutiérrez, Head of Research Administration

Now in regular operation, UDEM commits 0.8 FTE for general administration and an additional 2 FTE who provide data curation and validation centrally as a service for the researchers. In addition, staff from the research office and the library occasionally provide support, but not more than a few hours per month. Most of these supplemental staff resources are used to validate old publication data and organisational units.

Pure is primarily used by UDEM for internal reporting and research performance assessments of the staff members. Similar other *Pure* institutions, UDEM chose to link research performance assessments with *Pure* use to drive researcher engagement with *Pure*. The rule

was simple: If the data is not in *Pure*, it doesn't count for the researcher's evaluation and potential career progression. *Pure* has also been used to streamline reporting to the government (both from the institution and individual researchers at different intervals) as part of a national financial incentives program that generates supplements to researcher salaries. The result of these policies and procedures has been that most UDEM researchers have entered all their research outputs, usually spending an average of 8 hours on this work once per year. Researchers also use *Pure* to comply with monitoring related to internal department-specific goals.

Results & Lessons learned

UDEM's lessons learned reflect the experience of a small, but rapidly developing research institution.

- **Expert guidance in *Pure* customisation provides critical flexibility.** When UDEM's *Pure* implementation process revealed the need for unique functionality, the provider adjusted the implementation team personnel to provide expertise in customised configuration of *Pure* for diverse UDEM use cases. UDEM recognises this flexibility and implementation expertise as a key asset of their *Pure* installation.
- **Sharing of best practices by *Pure* and through *Pure User Groups* enhances ROI.** As a young research university UDEM selected *Pure* partly to join a global community of leading universities they could learn from and collaborate with. Engagement with *Pure User Groups* is helpful, but UDEM also believes *Pure* could be more pro-active in directly promoting known best practices and facilitating exchange of information between institutions using *Pure* so that UDEM can improve the way they work internally to reduce TCO and improve ROI.
- **Continuous development of *Pure*, informed by a large global community of *Pure* users is an asset.** Another reason UDEM selected *Pure* was because the large community of *Pure* users means that *Pure* will continuously develop *Pure* to meet the evolving challenges of the *Pure* community.
- **Standardising data for reliability can require significant time and sophisticated staff skills.** UDEM intends to extend the use of *Pure* to include its Awards Management Module. At the moment, some data for this module can only be updated through XML files. This requires significant technical skills from the research office staff. UDEM recommends product development that will enable direct data entry through the user interface or other import formats.

6.5 Elsevier case studies: Monash University, Australia & Saint Petersburg State University, Russia

In addition to the brief case studies above, emerging from this 2020 investigation, two additional case studies are available online from Elsevier. These studies profile *Pure* implementations which replaced aging legacy solutions at Monash University in Australia and Saint Petersburg State University in Russia.

Case Study: Monash University
Seeking a Single Source of Truth with *Pure's* Awards Management Module
https://elsevier.widen.net/s/w7p5spslgr

The Monash University case study is especially useful for its detailed outline of challenges with pre-*Pure* solutions.

Elsevier's *Pure:* Raising SPbU's global visibility in academic research
https://elsevier.widen.net/s/pptxfgrppj

The Saint Petersburg State University case study highlights the dilemma of whether to upgrade a current DIY solution or move to a commercial RIMS, with a special focus on research visibility.

7

RECOMMENDATIONS FOR REDUCING TCO

7. RECOMMENDATIONS FOR REDUCING TCO

Input from the survey, interviews and desk research led to a number of recommendations on what institutions and Elsevier can do to reduce TCO.

The overall indication from experience-based cost estimates is that implementing a system like *Pure* already delivers a significant ROI. However, there is much that institutions can do to leverage their investment to further reduce TCO. Participants also made suggestions of ways that Elsevier could further help institutions reduce the TCO of *Pure*. The sections below outline these recommendations.

7.1 Recommendations for institutions

Institutions have the potential to reduce their TCO for *Pure* by over 50% through leveraging best practices and lessons learned.

Based on their experiences implementing and operating both DIY and *Pure* solutions, participants indicated that institutions themselves can reduce their TCO of *Pure* by up to 50% if they follow some simple recommendations.

Buy instead of build

DIY RIMS solutions are more expensive overall than implementing a commercial RIMS, regardless of whether the DIY solution is completely custom built from scratch or, more commonly, developed based on an existing system or component parts. Staff resources for continuous development, technical support for users and system maintenance are significantly more costly than paying an annual support and maintenance fee to a provider for these services. In addition, as described in the case studies, the longer a DIY solution is in place, the harder it is to maintain and develop.

Open source components are intended to leverage a large community of developers for continuous development, but they still require internal resources for implementation, integration with other systems and continuous maintenance and development. With commercial RIMS, like *Pure*, many institutions are paying smaller amounts to cover joint development costs.

There are several risks with DIY solutions that should be taken into consideration, most notably staff dependencies and security dynamics. Many institutions underestimate these costs for DIY solutions and sometimes feel trapped by legacy systems even when they are not delivering the value intended.

When solutions are developed locally, the institution becomes dependent on an internal team that is usually small. If a critical staff member leaves the university, it often becomes very difficult to maintain the solution. The security of servers and data handling also requires significant resources to manage effectively. Security management includes regular monitoring and updating to comply with the latest security protocols and systems updates. It also includes ensuring that updates to one system do not compromise security or functioning of integrated systems. Security incidents can compromise the data in the RIMS solution, but, even more importantly, they can threaten institutional networks and data, much of which is private and confidential. Some institutions consulted indicated that they had initially felt DIY solutions would be more secure. Ultimately, after challenging experiences, they determined that it was more effective and efficient to rely on a fully managed service backed by a large team experienced in running secure operations at scale.

Risk areas related to implementation can be exceptionally costly. As discussed in section 4.4 Annual opportunity costs, DIY solutions developed internally run much higher risks of not fully complying with institutional needs, not meeting deployment deadlines, and in some cases, failing to deploy at all. Commercial RIMS like *Pure* have long histories of development and

broad user communities that minimise the risk of these costly failures.

Host in the cloud

Hosting internally is significantly more expensive than cloud-hosted and managed services. In addition to fees for hardware and security services, local hosting requires significant staff time to manage effectively. Providers of RIMS solutions benefit from economies of scale when it comes to hosting and pass these savings to clients. They also retain teams dedicated to comprehensive and expert management of the platform. Some institutions have indicated that earlier preferences for local hosting were based in part to "own" the data. This is a misconception. All institutions using *Pure* own all of the data in their solution, regardless of where the solution is hosted.

Prepare before implementation

A critical element of smooth implementation and cost-effective operation of any RIMS is for the institution to be fully prepared before the RIMS implementation starts. An internal implementation team, with adequate resources and a dedicated project manager, needs to be established in advance of kick-off. The team should have "buy in" from institutional leadership and representation from, or at least clear agreements and understandings with, the library, research office and internal IT team. Strong inter-departmental relationships help to ensure that implementation processes and decisions can be executed without delay. The project team should be small and empowered to take most decisions directly themselves in order to proceed quickly without having to wait for other internal parties.

It must be clear from the beginning that any RIMS will need to continuously evolve as institutional needs and challenges evolve over time. It should be clear who the owner of the system is and what processes and mechanisms exist to address evolving requirements quickly and regularly.

Implement the rollout in stages

If an institution intends to implement the full spectrum of modules and capabilities of a RIMS, it will inevitably take longer to go live with the system than if only one module is implemented. By scheduling rollout of one module at a time, internal resources can be more focused. This is especially important when other departments (e.g., library) or systems (e.g., human resources) are involved. A staged approach enables the institution to generate "quick wins" and begin generating return on their investment earlier. Implementing a solution in a smaller scope first also gives everyone the hands-on experience and important lessons learned that can be considered for later stages of the implementation when other modules are added.

Streamline management of product updates

With commercial RIMS, institutions should plan carefully to manage new releases efficiently. All updates, whether they are major or minor upgrades or smaller security patches or functional updates, requires testing of impacts on security and system integration prior to deployment. Many updates also require communication with end users to ensure they are aware of and can benefit from the new development, especially as some updates may suggest changes to workflows to improve efficiency. Institutions have found that it is often more cost-effective to schedule groups of updates at designated times, if possible, rather than as they are made available. These decisions depend on the type and volume of updates and the affected systems and users, but it is important for institutions to be aware that every upgrade requires resources for testing, deployment and communication so that they can plan efficiently and keep staff time required to a minimum.

Apply best practices from other institutions

An important advantage of choosing a commercial RIMS is that the institution can leverage the solution's user group community. In *Pure's* case, this is a very large global community with many regional and national *Pure* User Groups and regional conferences. Participation in these communities enables institutions to identify best practices from others and often to re-use strategies developed by other institutions. This is especially useful when national research policies affect research information management for many institutions.

7.2 Recommendations for Elsevier

As the provider of *Pure*, the global market leader for RIMS, Elsevier has the potential to further leverage its global community of institutions and further reduce TCO for institutions.

While *Pure* already has many TCO advantages over DIY solutions, participants surveyed and interviewed identified strategies Elsevier could take that would help institutions reduce the TCO for *Pure* even further. The most common recommendations are listed below.

Share best practices

The number of institutions using *Pure* has grown very quickly over the years into a large, global community. There are lessons learned with each implementation and many best practices can be identified for handling different aspects of the implementation and operation of *Pure*. Best practices are already being shared, in *Pure* User Groups and through the annual *Pure* conferences which share best practices and open the door for more direct collaborations and exchange between the different institutions and with Elsevier. This whitepaper is another example.

However, institutions have suggested that Elsevier could do more to make best practices they know about more easily identifiable and accessible across the community of institutions using *Pure*. Elsevier may be able to better publicise the current activities. But participants also suggested Elsevier could identify and share these best practices more systematically, publish more case studies and potentially develop a kind of expert database of key people at *Pure* institutions who are willing to share their expertise on different topics.

Facilitate the re-use of data across institutions

With many *Pure* users globally, there are increasing overlaps in data. For example, co-authors from different universities may have the same article in their respective institution's *Pure* installation. It should be possible for the *Pure* structured data for these publications to be available for re-use across *Pure* instances. Institutions encouraged Elsevier to investigate this possibility as it would reduce the workload of manually entering and validating records, further reducing TCO for *Pure* users.

Leverage national *Pure* User Groups for prioritisation of development plans

There was a perception among a number of participants that the management of suggestions, requests and related prioritisation for the continuous development of *Pure* has become more difficult as the number of *Pure* institutions has increased. These participants recommended that Elsevier better leverage region specific *Pure* communities and user groups to assist in vetting development plans for *Pure*. By having each national or regional *Pure* User Group suggesting and reviewing the development plan, Elsevier could reduce complexity and improve efficiency and effectiveness in development and ensure all clients feel fairly accommodated.

This recommendation seemed somewhat surprising as *Pure* already works actively with user groups and clients to respond to development suggestions. It may be useful for Elsevier to develop new or more frequent methods for communicating about the cooperative development process to the *Pure* community.

Support custom development needs

Institutions often require specific custom development to meet their evolving needs, even with a commercial solution. If that development is not accommodated as part of the roadmap for *Pure*, institutions often pay a third party for custom development that is only loosely connected with *Pure*. Some participants suggested that Elsevier offer custom development services. As a global product provider, *Pure's* development resources are focused on addressing requests that best improve the product for the most users. However, one of the "alternative" suggestions from participants was that perhaps Elsevier might consider preparing a list of recommended custom development partners (e.g., *Pure* certified developers and consultants). This would enable institutions to identify specialists with documented experience integrating with *Pure*. Such a network would also enable small custom *Pure* "add-ons" to be shared more easily among *Pure* clients, which would further reduce TCO for some institutions.

Communicate on balance between ongoing development vs. volume of releases

Another area that would appear to benefit from more or better communication from Elsevier involves the tension between responding to product development requests and limiting the number of releases requiring technical and administrative attention from institutions.

While some participants wanted more active engagement in the development roadmap for *Pure*, many also indicated that they struggled with the volume of *Pure* releases annually. The administrative effort required for testing, deploying and communicating with users about these releases was identified as an area where TCO could be reduced.

The challenge, of course, is that demand for development of new *Pure* features naturally results in releases of those new features. It may be useful for Elsevier to consider finding ways to acknowledge these competing demands from the user community and to offer suggestions for users on how to be more efficient in managing releases. For example, some institutions prefer to "jump" several versions due to resource constraints. At the very least, it appears that guidance from Elsevier on release management strategies would help institutions reduce this aspect of their TCO.

CONCLUSION: BUY OR BUILD?

8. CONCLUSION: BUY OR BUILD?

Buying a commercial solution, like *Pure*, has significant cost and value advantages, but each institution is unique and must integrate their own goals and internal assets with sound cost and value estimates to make a wise decision.

Managing institutional research information is an increasingly complex and critical challenge for universities. Selecting the most effective and efficient solution is equally complex and critical. The investigation outlined in this whitepaper suggests that Elsevier's *Pure* RIMS product provides significant added value and lower cost compared to DIY solutions:

- *Pure* generates 70% more value than DIY solutions
- TCO for *Pure* is lower
    - 28% less for small institutions (DIY TCO: 6.5 FTE; *Pure* TCO: 4.7 FTE)
    - 41% less for large institutions (DIY TCO: 55.6 FTE; *Pure* TCO: 32.6 FTE)
- ROI for *Pure* is higher after one year and even higher in future years
    - 37% for small institutions (DIY ROI (loss): -56%)
    - 71% for large institutions (DIY ROI (loss): -56%)

Given the costs and return on investment at stake, however, decision makers may be overwhelmed by the many factors involved in a RIMS solution decision, implementation and operation. The experiences of participants, most of whom are intimately familiar with at least two types of RIMS solutions, suggest that decision makers should:

- Consider all the relevant variables involved in a RIMS solution, including careful assessment of risks (see section 4. Costs & value),
- Use the RIMS TCO Calculator to guide cost and value estimations and comparisons (see section 5, RIMS TCO Calculator),
- Learn from colleagues at similar institutions about their experience with different factors (see section 6, Case studies),
- Clarify leadership of the RIMS solution and empower internal teams for efficient management to reduce TCO (see section 7, Recommendations), and
- Ensure that decision making and planning are designed to balance institutional goals and assets with realistic assessments of cost, value and risk.

The costs and value comparisons between DIY and *Pure* detailed in this whitepaper, along with case studies, tips for how institutions can reduce TCO, and the RIMS TCO Calculator, provide an introduction to these issues. The benchmark comparison indicators offer valuable orientation for decision makers. The practical, experience-based guidance and tools support institutions in being systematic in their approach to their RIMS decision.

Reliable integration of relevant cost and value information is essential for making evidence-based decisions about the RIMS solution that will enable institutions to drive, support and highlight their research excellence.

9 APPENDIX

Annex A: Investigation questions
Annex B: List of acronyms
Annex C: Sources

Annex A: Investigation questions

The questions below were used to guide in-depth interviews, and most were asked in the online survey. Additional materials (e.g., *Pure* purchasing records) were also consulted to answer or provide context for these questions.

Software and infrastructure costs

- What *Pure* modules are you using?
- How much have you paid as a one-time license for *Pure*?
- How much have you paid as one-time implementation fee for *Pure*?
- How much staff time do you estimate that you needed for the implementation of *Pure* (in FTEs)?
- How much do you pay in annual support & maintenance fees for *Pure*?
- How much staff time do you estimate that you need for supporting *Pure* on an annual basis (in FTEs)?
- How long time did the implementation take from kick-off to initial go live (months)?
- What are your costs for hosting *Pure* (in staff time or money, if not included in the annual support & maintenance fees)?

Staff costs

- How many administrators work with *Pure*?
- How much time do you estimate that each administrator spends on average for handling the data in *Pure* per year (FTEs)?
- How many faculty members does your institution have?
- How many of the faculty members do you estimate work with *Pure*?
- How much time do you estimate that each faculty member spends on average for entering data into *Pure* per year (hours)?

Opportunity costs

- Before deciding for *Pure*, what preference did you have for the following aspects?
    - Building vs. Buying (1 = much in favour of building, 3 = did not play any role, 5 = much in favour of buying)
    - Customization possibilities vs. Off-the-shelf (1 = much in favour of customization, 3 = did not play any role, 5 = much in favour of off-the-shelf)
    - SaaS vs. Hosting locally (1 = much in favour of SaaS, 3 = did not play any role, 5 = much in favour of Hosting locally)
    - External vs. Internal support only (1 = much in favour of external support, 3 = did not play any role, 5 = much in favour of internal support only)
- Did your preference change in any way after taking *Pure* into operation? Please indicate your preference today. (same aspects as previous question)
- What did you use as a solution before *Pure*? (1) Nothing, (2) Custom built / DIY, (3) Other commercial solution (indicate which one)
- Compared to what you had before what is the degree of your perceived added value of the following capabilities? (N/A – not using, (1-10, where 10 = 100% or more added value, 5 = not more or less, 0 = 100% less
    - Increased visibility for collaborations and rankings (*Pure* Portal, CV Module)
    - Analytics & decision making (Reporting Module, National Assessment Module)
    - Compliance with OA policies (Core Module, including full text repository)
    - Attract more funding (*Pure* Awards Management Module)
- Compared to what you had before, what is your estimated staff time savings for administrators? (1-10, where 10 = 100% less work now, 5 = not more or less, 0 = 100% more work now)
- Compared to what you had before, what is your estimated staff time savings for your faculty members? (1-10, where 10 = 100% less work now, 5 = not more or less, 0 = 100% more work now)
- What other comments or remarks do you have with regards to *Pure*? (e.g., any other cost or benefit aspects that should be considered)

Annex B: List of acronyms

- **CRIS:** Current research information management system. A CRIS is considered the same as a RIMS. CRIS is the more common term in Europe. In this whitepaper, RIMS is used to mean either.
- **FTE:** Full-time equivalent, i.e., a full-time employee. FTE has been used as a common metric for integrating and comparing cost estimates for *Pure* and DIY RIMS across diverse institutions and economies.
- **PRS:** Profile Refinement Services, a service that Elsevier provides to pre-populate *Pure* with researcher profiles using data Elsevier has access to.
- ***Pure:*** The RIMS product offered by Elsevier.
- **RIMS:** Research information management system. A RIMS is considered the same as a CRIS. CRIS is the more common term in Europe. In this whitepaper, RIMS is used to mean either.
- **ROI:** Return on investment, i.e., the final value of investment less the initial investment (the "returned" value. For analysis in this investigation, the ROI refers to total value gained by an institution less the investment to implement and operate a DIY or commercial RIMS like *Pure*.
- **SaaS:** Software-as-a-service, i.e., a software that can be used directly without a separate local installation. SaaS when *Pure* and other commercial RIMS are hosted in the cloud by their provider instead of requiring an installation to be made by the institution.
- **TCO:** Total cost of ownership, i.e., the total costs for owning something. In this whitepaper, TCO refers to the total cost of procuring, implementing and operating a RIMS.

Annex C: Sources

This whitepaper is based on research using the primary and secondary sources below.

- An online survey, soliciting participation from most of the institutions using *Pure* as of September 2020 (non-traditional types of clients were excluded)
- Interviews held during September – October 2020, with a subset of survey participants, including King's College London (UK), Manipal Academy of Higher Education (India), RTI International (USA), University of Birmingham (UK), University of Copenhagen (Denmark), University of Manchester (UK), Universidad de Monterrey (Mexico), and Western Sydney University (Australia)
- Reports from *Pure* purchasing records to assess average costs
- Bryant, Rebecca, Anna Clements, Pablo de Castro, Joanne Cantrell, Annette Dortmund, Jan Fransen, Peggy Gallagher, and Michele Mennielli. 2018. Practices and Patterns in Research Information Management: Findings from a Global Survey. Dublin, OH: OCLC Research. DOI: https://doi.org/10.25333/BGFG-D241.
- Case studies published by Elsevier:
  - Monash University [Australia] – Seeking a Single Source of Truth with *Pure*'s Awards Management Module [Australia]. Available from: https://elsevier.widen.net/s/w7p5spslgr
  - Saint Petersburg State University [Russia] – Elsevier's *Pure*: Raising SPbU's global visibility in academic research. Available from: https://elsevier.widen.net/s/pptxfgrppj
  - University of Vienna [Austria]: A researcher-centric approach to research reporting and evaluation. Available from: https://www.elsevier.com/__data/assets/pdf_file/0005/917087/ACAD_LIB_*PURE*_CS_University-of-Vienna_WEB.pdf
- Webinar: Research Management with *Pure* in Russia, May 2020. Available from: https://www.brighttalk.com/webcast/10439/408497
- Presentations from *Pure* User Group Conferences, October – November 2020