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Consumption Practices of Engineers: Standards as Part of Workflow

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Why This Market

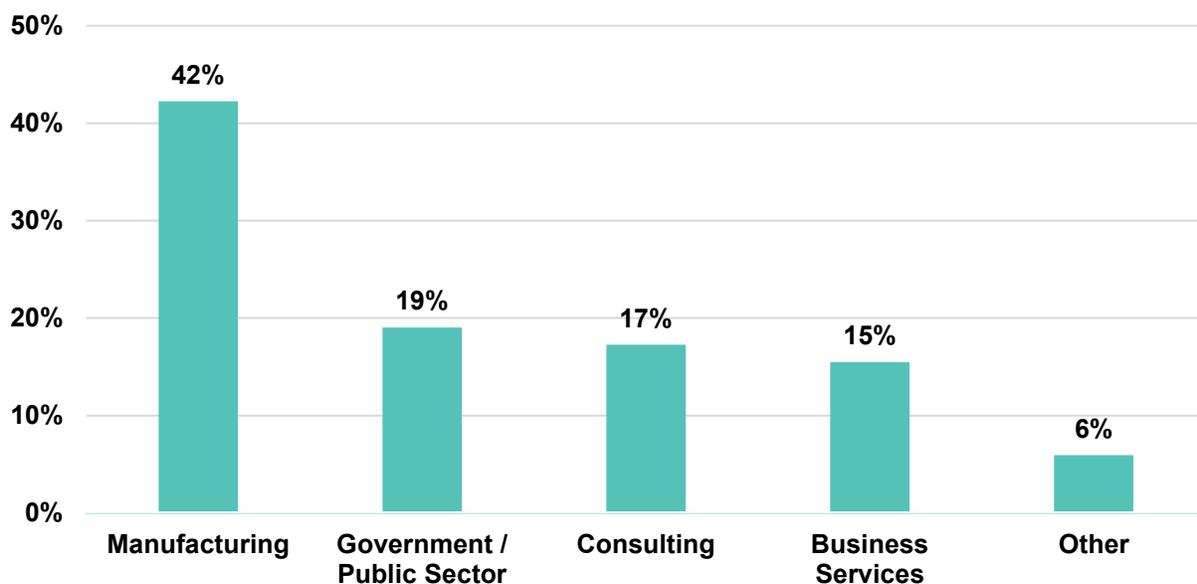
Standards are a key information source for the practicing engineer at most stages of product design through commercialization. User behaviour indicates areas of opportunity for standards vendors as workflows adapt to the pace of technology change and the reality of “remote engineering.”

Methodology

In December 2021, we surveyed 400 professional engineers, asking about their routines and preferences for consuming specialized sources of information supplied by external providers. The respondents were limited to those having a degree in engineering and asked to provide their engineering background, employment sector, and current role. For this report, we have selected the responses of those who chose standards and standards-related information as one of the specialized sources of information they use routinely, producing a sample of 168 or 42% of the original sample.

As seen in Figure 1, 42% of respondents indicated manufacturing as their employment sector, with the next largest cohort working in government and the public sector (19%).

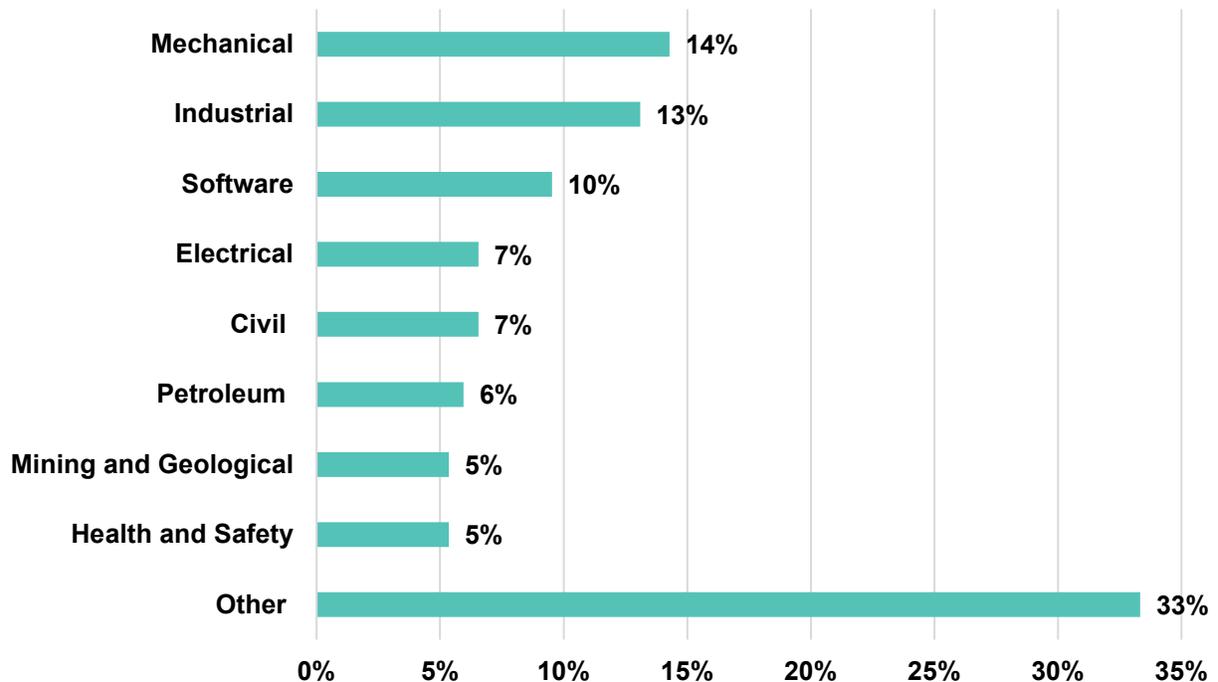
Figure 1: Current Sector of Employment of Respondents



Source: Outsell, Inc.

As seen in Figure 2, the engineering backgrounds of the three largest groups of respondents were mechanical engineering (14%), industrial engineering (13%), and software engineering (10%). The large (33%) “Other” category includes 10 types of engineering backgrounds with responses under 5%. This breakdown illustrates well the fragmented nature of the engineering solutions marketplace.

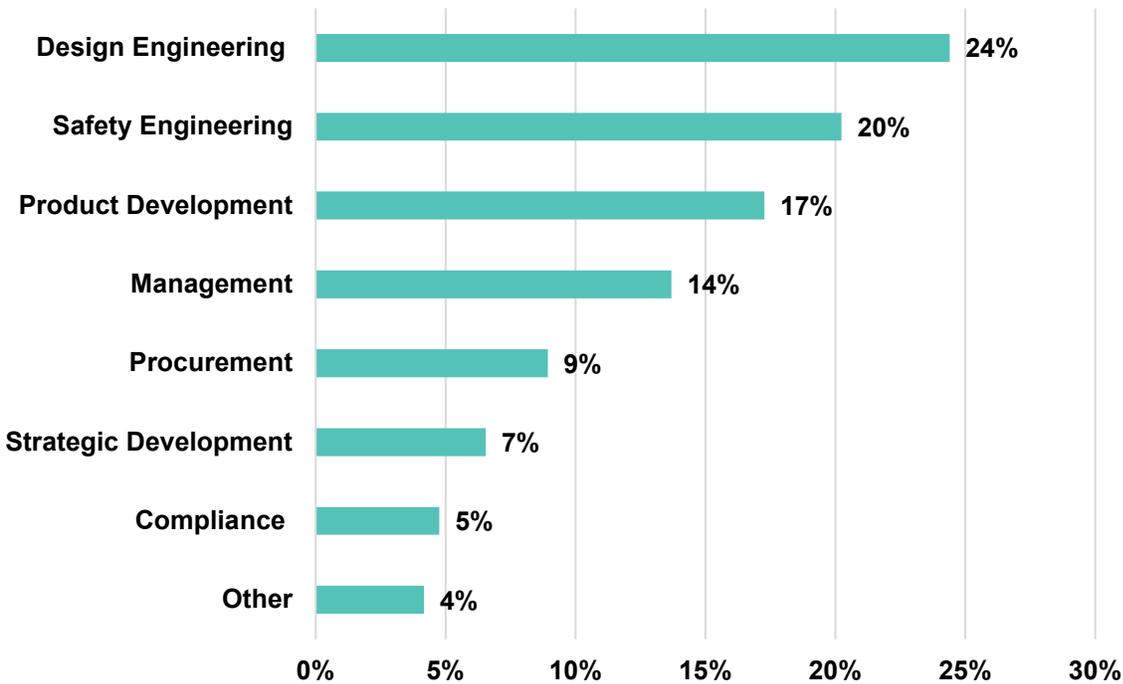
Figure 2: Engineering Backgrounds of Respondents



Source: Outsell, Inc.

As seen in Figure 3, the most common roles were design engineering (24%), safety engineering (20%), and product development (17%).

Figure 3: Current Roles of Respondents



Source: Outsell, Inc.

While the sample included a broad range of engineering backgrounds and professions, our examination of the data segmented by that background and professions yielded very few distinctions. For this reason, this analysis looks at the entire respondent base.

Key Findings

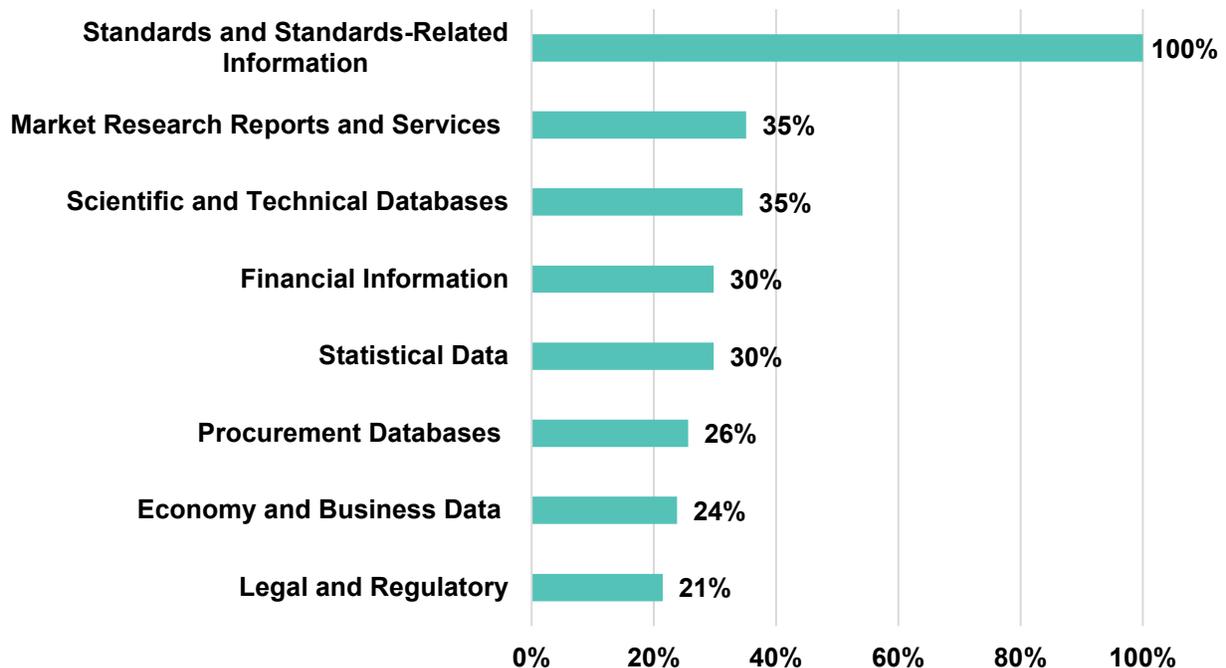
The behaviours of standards users reflect their diverse backgrounds, eclectic information diets, and varying ecosystems of professional networks. Users of standards are likely to use sci-tech databases and market research reports. They access their external sources frequently, often daily, and are very likely to share the documents they access. Most have paid subscriptions provided by their employers; nevertheless, the likelihood of access via informal channels such as peer-to-peer networks is very high. Users spend most of their working time in front of their personal computers, likely accessing the information on their mobile devices only for quick reference.

Mission-Critical Information Types

To understand the types of information that engineers see as critical, we asked the respondents to identify the top three categories of specialized external sources of information they rely on in their work. As seen in Figure 4, standards users are likely to consume a broad range of other content types. For example, market research reports and sci-tech databases tied, with 35% of respondents selecting them. The top three responses are to be expected from the roles that emerged as top three in Figure 3: design, safety, and product development engineering.

One surprising outcome was the legal and regulatory category of content being the least important for respondents, with only about one in five respondents choosing it, given that standards are frequently used to meet regulatory requirements and some are referenced in legislation. Our hypothesis is that the role within an enterprise responsible for market access, entailing knowledge of regulatory requirements and associated standards, may reside outside the engineering team.

Figure 4: External Sources of Mission-Critical Content



Source: Outsell, Inc.

Question: What top three categories/types of specialized sources of information supplied by external providers do you rely on that are mission-critical for doing your work?

The findings prove that critical content for engineers covers a wide variety of resources, some of which will fall into the general knowledge category in addition to technical reference. Users of standards also need to stay up to date in their fields, maintain their professional credentials, and contribute to strategic decisions in their workplaces — these are all mission-critical objectives requiring vetted, current information from a range of sources. Coming from disparate providers, this information competes for users' attention and obliges the user to get familiar with several content delivery and user interface offerings.

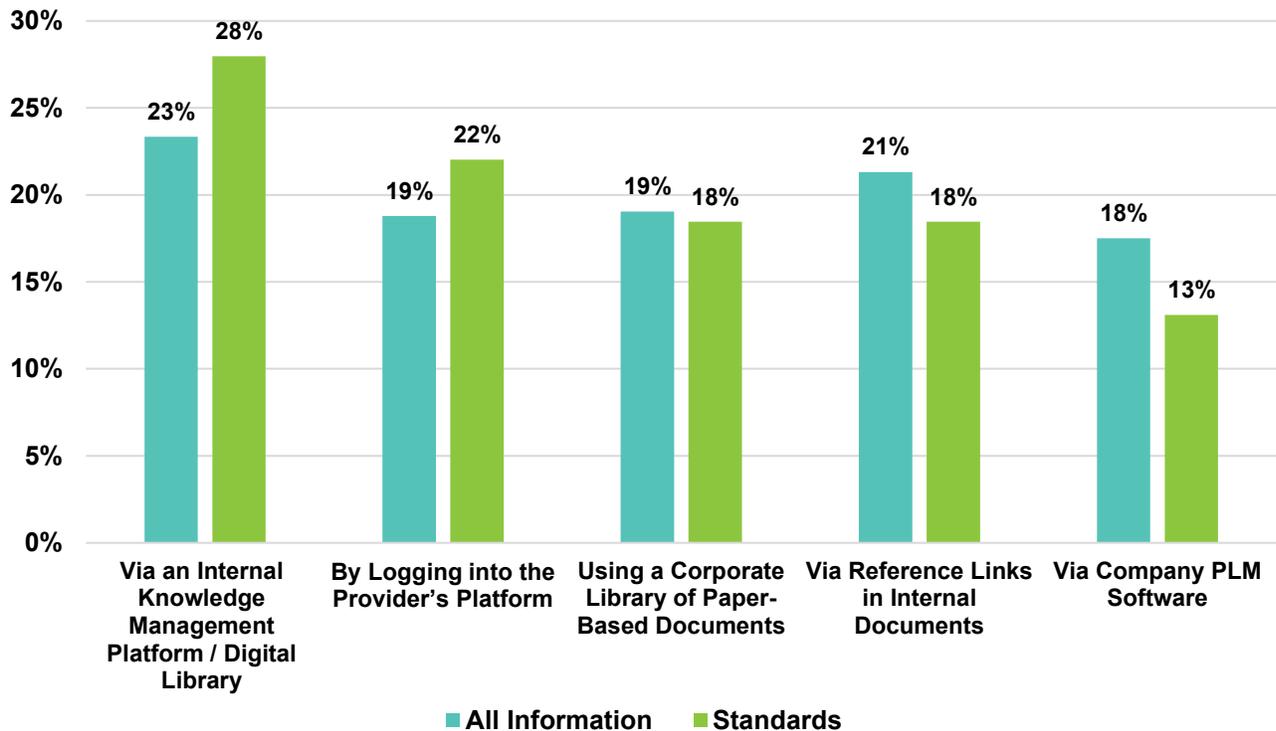
Standards vendors need to recognize the overarching context in which their documents are ultimately used and try to adopt a holistic approach to serving user needs. Standards vendors are recognized as being trusted sources of at least one type of mission-critical information; they need to consider expanding their offerings to serve a wider range of engineers' professional objectives.

Access to External Content

To understand the natural workflow processes of the respondents, we asked them to identify the top three typical ways that they access content (Figure 5). We asked this question twice: first in reference to accessing standards and standards-related information and then in reference to all the mission-critical types of content that respondents use. In both cases, access via internal knowledge management platforms led, with 28% of respondents using one to access standards and 23% to access all types of content (including standards).

Logging into the provider's platform is the second most popular choice for accessing standards (22%), but the second most popular answer for overall access to content is accessing via reference links in internal documents (21%). Frequent users of paper-based reference materials access both standards and the rest of their information in this way (18% and 19%, respectively). Finally, for users of standards, the least common way to access mission-critical content is through PLM software (18% of responses) — they do it even less often to access standards (13% of responses).

Figure 5: Typical Ways to Access Mission-Critical Content



Source: Outsell, Inc.

Question: How do you typically access information necessary for your work?

Standards are included in digital libraries, but they are not part of the PLM workflow. Except for use cases when this may be justified, interrupting the workflow to access technical data results in inefficiencies and a higher potential for human error if the data needs to be manually copied from the source. Legacy formats such as PDF are partly to blame for standards remaining outside PLM workflow, although the data implies that derivative documents are being created to provide access to standards and other content via interactive links.

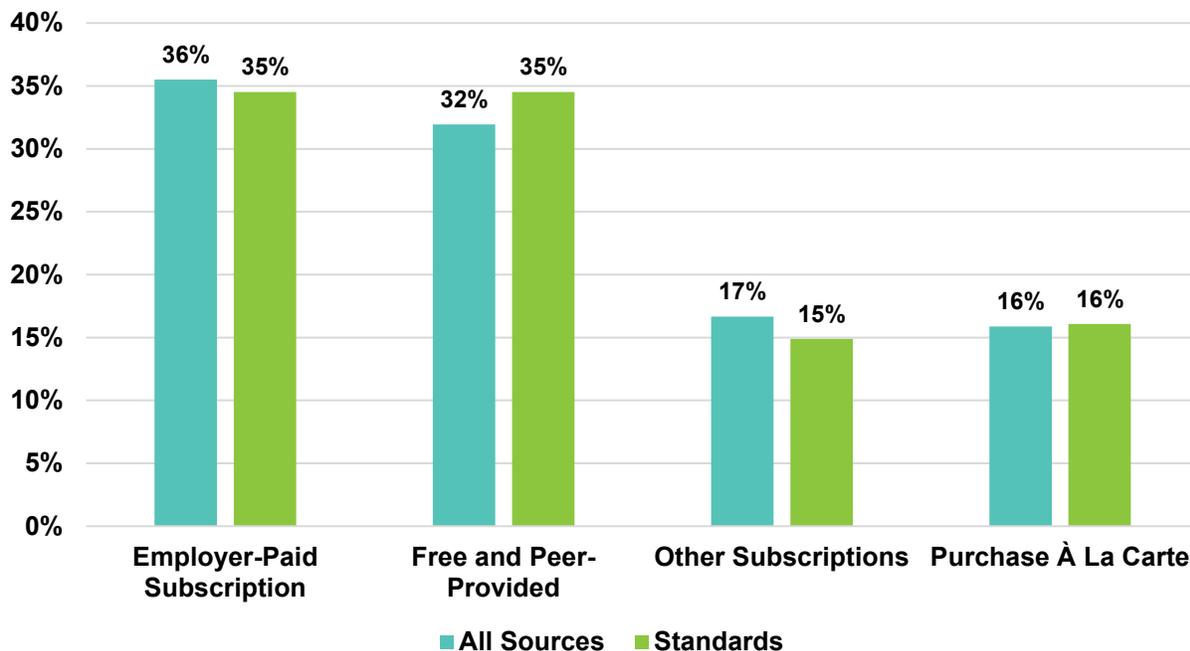
Within an internal digital library, a standard will be part of a collection of documents, although access through an internal library is unlikely to provide enhanced discoverability. Access by logging through the provider's platform still breaks the workflow but often comes with the benefits of enhanced discoverability, the ability to curate collections, and other features that add value. It is also the only access option that allows an information provider to have direct contact and feedback from the user.

In Outsell’s opinion, the data suggests significant room for growth for standards in terms of compatibility with the PLM workflow environment and availability via internal derivative documents, both of which are integrated paths of access to content.

Methods of Acquisition of External Content

To identify the dominant method of acquiring content, we asked the respondents how they acquire each of the mission-critical types of content they use. The data in Figure 6 shows little difference between the acquisition of standards and any other type of content, which is likely driven both by the availability of access provided by an employer and the overall information consumption habits of an individual. Employer-paid subscriptions emerged as the leading way to acquire mission-critical content at 36% for all content sources and 35% for standards. This method was closely followed by using free resources and resources made available by other users (at 32% and 35%, respectively). Using other subscriptions not paid by the employer (obtained through a professional association or an academic institution) is almost tied with purchasing materials as needed in the 15-17% range.

Figure 6: Preferred Method of Acquisition of External Content



Source: Outsell, Inc.

Question: Please specify how you acquire each type of externally supplied content you use professionally.

The data implies that, in 68% of cases, access to external content is paid on a subscription basis or on demand, most likely by the employer. This is certainly good news. However, users are as likely to get their materials through peer networks or free sources (the legality of which is unclear) as they are to have employer-paid subscriptions. For standards, there is a tie at 35% for these two ways to acquire access. In some cases, by turning to their peers for access, users try to rectify the issue of poor discoverability. In other words, they may have access to the document but be unable to find it in the library, be overwhelmed by the results of their searches, or need the help of a human expert to navigate their way to the exact edition they may need. In many other cases, there are cases of unlicensed use.

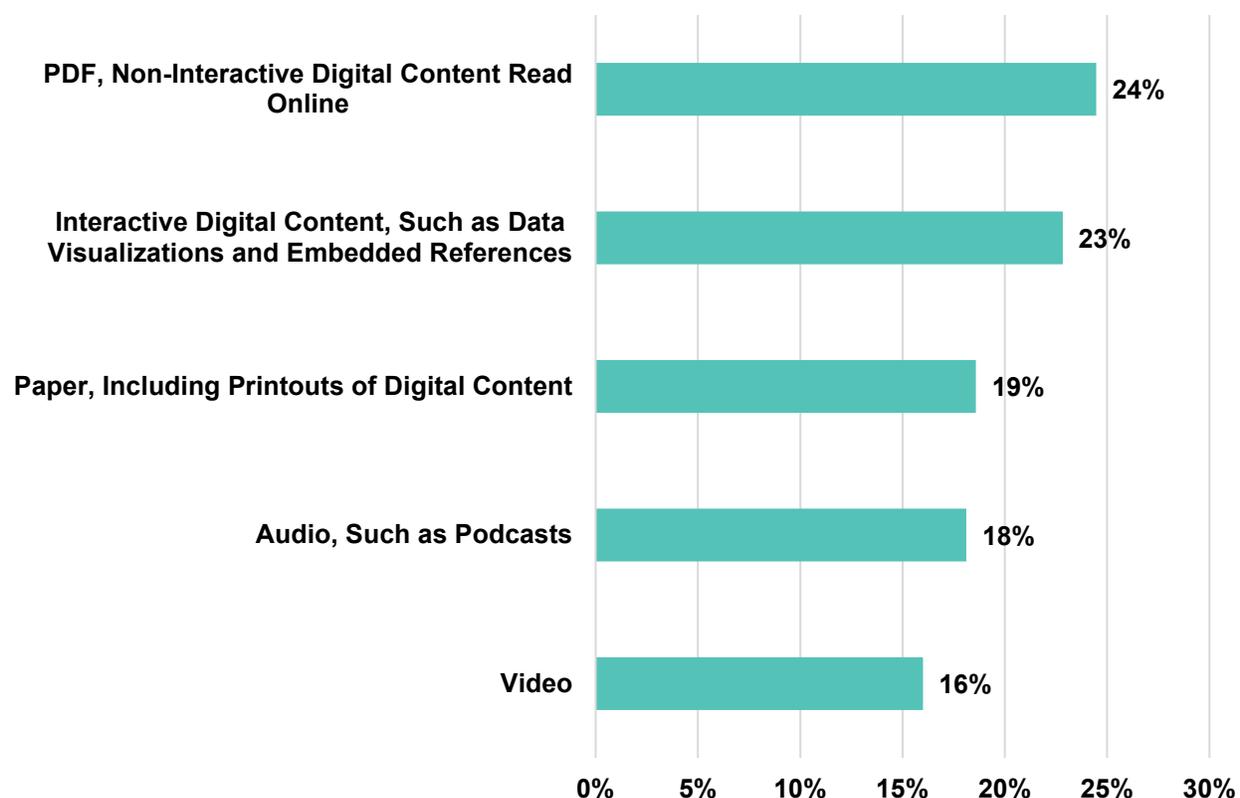
À la carte purchases speak to the more distributed way of sourcing and paying for information at a company level, replacing the function of a library as a central hub.

Peer-to-peer networks have emerged as a core component in the information ecosystem across the entire digital publishing marketplace. They provide a service by aiding discoverability as well as access to content that can be paywalled. Free resources are often available as part of a publisher's social mission, but publishers typically would like to avoid users' overreliance on them instead of taking out a subscription. In short, user propensity to use free and shared resources represents competitive pressure for publishers to deliver value-added features worth subscribing for. Ease of discovery needs to be a priority to minimize the role of peer networks as a search engine.

Dominant Formats in Use

To uncover the leading formats in use, we asked the respondents to indicate the top three formats they use most often. The results reveal that the two leading formats are the classic non-interactive PDF and digital content with some degree of interactivity, at 24% and 23% of responses, respectively (Figure 7). Paper, including printouts of PDF documents, came in third at 19% of responses, followed by audio.

Figure 7: Typically Used Formats of Specialized Sources of Information Supplied by External Providers



Source: Outsell, Inc.

Question: What formats of specialized sources of information supplied by external providers do you typically use?

We were not surprised to see the non-interactive formats (PDFs read online and paper) coming to 43% of all responses as the most frequently used by standards users, since all standards vendors offer PDF as a default option. In turn, PDF as the leading type of format influences the choice of the environment in which the content is consumed; this was reflected in the low use of PLM software, as discussed previously. Documents with some degree of interactivity would be more readily accessed from within a PLM environment and through links in internal derivative documents, and at 23% of responses, this category shows potential to take away share from the less interactive formats. However, the demand for more interactivity is further affected by the level of technological maturity of a company, the level of R&D activity in its markets, and the dynamics of its immediate competitive environment. Finally, in the case of standards, large user groups (such as those working in construction) need hard copies of documents for locations with unstable internet.

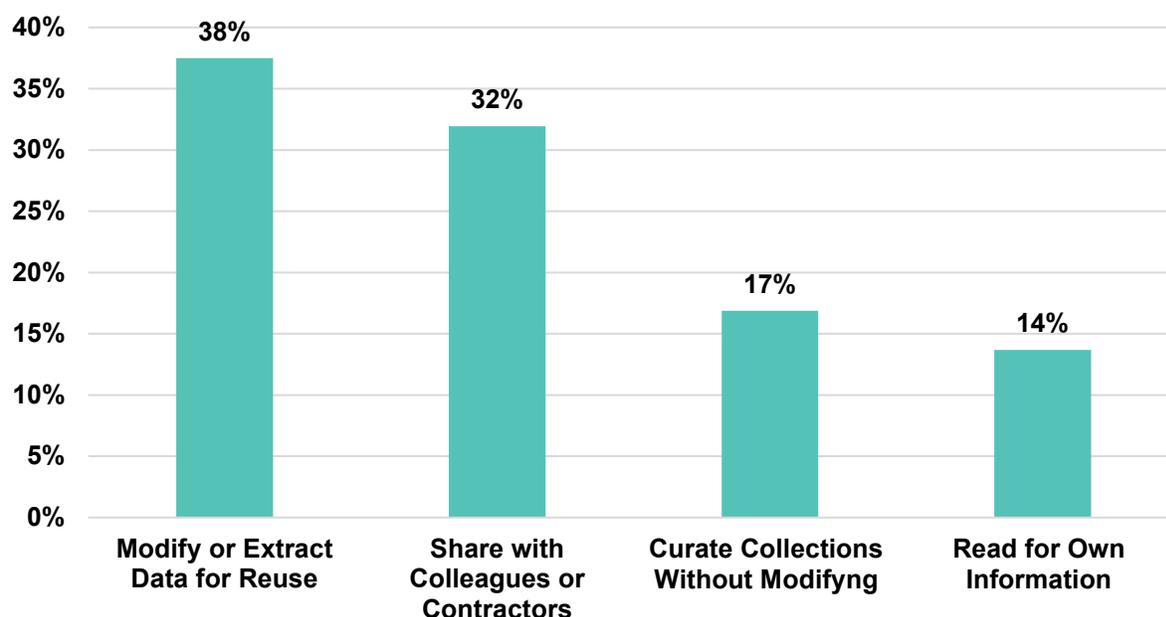
Against this complex background, Outsell’s recommendation to standards publishers is to look for ways to replace legacy static formats with interactive options. This will help promote standards as a valuable resource at an earlier stage of R&D when the speed of discovery is significant for long-term outcomes. As for the end-user in the field, interactive formats can translate into efficiencies and improved data accuracy.

Information Consumption: Steps Following Discovery

Different use cases drive differing demands for formats and functionalities, such as interactive features. To understand these, we asked respondents to identify their top three most common next steps when it comes to the consumption of information provided by external suppliers.

As seen in Figure 8, modifying or extracting data for reuse emerged as the most common next step, at 38% of all responses, closely followed by sharing with colleagues or contractors at 32%. Creating collections without modifications was third at 17%, followed by reading for their own information at 14%.

Figure 8: Typical Next Steps When It Comes to Externally Sourced Content



Source: Outsell, Inc.

Question: Once you have found relevant information from external providers, what next steps do you typically take?

The data implies that external information is likely to serve as input for a model or an internal document or as a resource in a collaborative project. The intensity of sharing and user-driven curation can be a factor in the discovery capabilities of a particular type of access, as discussed earlier in this report. When discovery is not reliable, users create custom portfolios of documents or ask their colleagues for copies instead of searching for them as needed.

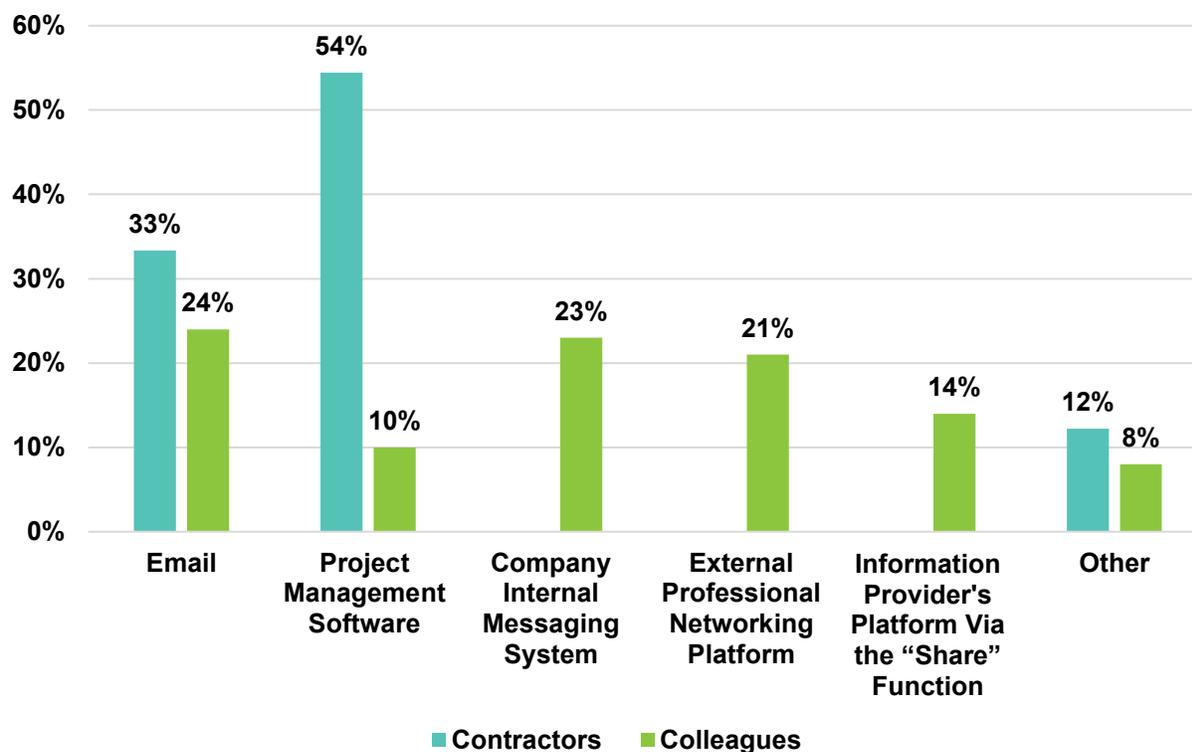
Sharing can also reflect the types of content acquisition adopted at a particular company. For example, there may be a super-user within a team subscription that takes care of ongoing updates on behalf of the team. Overall, publishers need to assume that their user pools are larger than the list of subscribers. This poses issues of unlicensed use and, in the case of standards, acts as a barrier to offering more granular access to content. On the other hand, if there is a tendency to consume information as part of a collaborative effort, perhaps licensing needs to reflect this more accurately. Finally, moving away from manual data extraction for models will help improve accuracy, a benefit that can be marketed as a value-adding feature.

Methods of Sharing External Information

The preferred methods of sharing information provide further insight into the consistency of workflows. We asked the respondents to select one preferred method for sharing information internally with their colleagues and externally. For the external component, we provided only three options: “Email,” “Project Management Software,” and “Other.” For sharing with colleagues, we assumed a wider range of options, both internally controlled (such as a company messaging system) and employer-independent (such as a peer networking platform).

For sharing information with external contractors and suppliers, project management software leads by a large margin at 54%, followed by email at 33%. Internal sharing is not dominated by any specific method; however, project management software is the least popular option at 10%. Internally, users are likely to use email, an internal messaging system, or a professional networking platform, with all of these options in the 21-24% range. In 14% of cases, they use the information provider’s platform via the “Share” function.

Figure 9: Preferred Methods of Sharing External Information with Colleagues or Contractors



Source: Outsell, Inc.

Question: What is your preferred method of sharing external information with your colleagues and contractors?

The data suggests that when users share content externally, they tend to use a shared project management hub (such as Microsoft Teams) in cases when they are not emailing the information. Email is a predictably popular, if inefficient, way of sharing information both internally and externally. However, internally, a wider variety of channels is deployed in addition to email. An interesting outlier in this ecosystem of largely internal communication channels is an external peer-to-peer platform, which is used to connect with coworkers. All these methods imply that documents are likely downloaded and shared outside of the publisher-controlled environment.

Publishers would prefer that all users use the native "Share" button to share content since it favours authorized use and tracks usage data. The use of the "Share" function on the provider platform is, therefore, a valuable window into the consumption practices of a small subsegment of users who choose this method. This data will help publishers understand what type of content is shared on the platform, the type of license that is

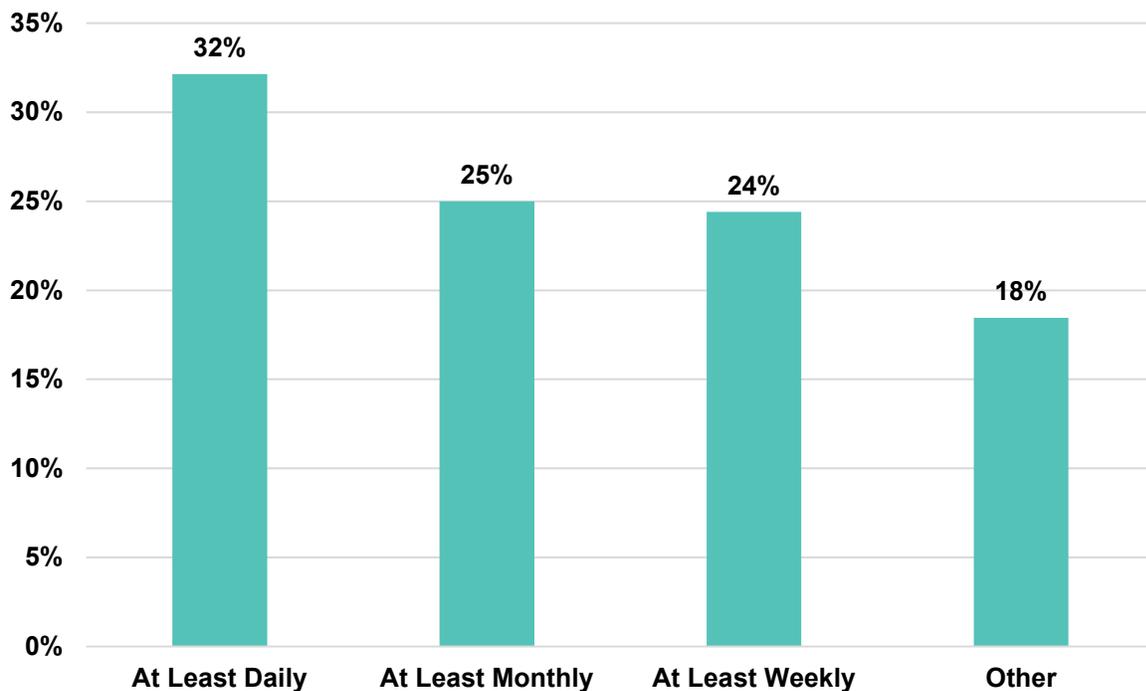
likely to promote sharing on the platform, and the user experience features that would support it.

Frequency of Access and Preferred Devices

Frequency of access is a good indicator of the pertinency of specific information. We asked the respondents how often they access the information supplied by external vendors and their preferred devices for accessing this information.

As seen in Figure 10, 32% of users access their information resources daily, with the next two most popular options accessing at least once a month or at least once a week, effectively tied with 25% and 24% of responses, respectively. Figure 11 shows that the preferred access device is unequivocally a personal computer (laptop or desktop) at 76%, with mobile gathering the remaining 24% of responses.

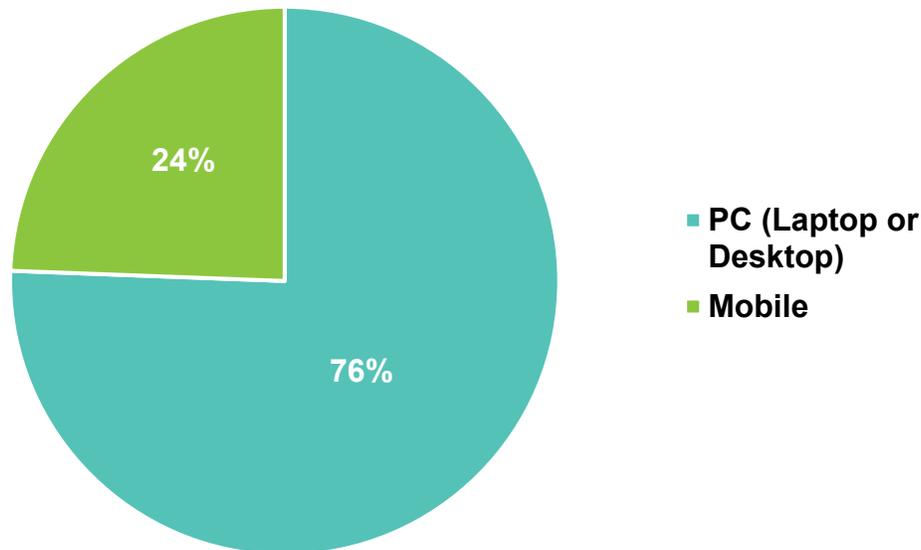
Figure 10: Frequency of Access to Specialized Sources of External Content



Source: Outsell, Inc.

Question: How often do you access specialized sources of information?

Figure 11: Preferred Access Device



Source: Outsell, Inc.

Question: What is your preferred access device for the information you use professionally?

Frequent daily and weekly usage provides positive feedback for publishers striving to deliver mission-critical information. Higher usage levels provide excellent grounds for nurturing a relationship with the user by covering most of their information needs from a variety of sources, as we discussed earlier in this report. Less frequent use leads to a transactional relationship that can potentially deteriorate into à la carte purchases of paywalled content. Users’ preference to access content on a personal computer as opposed to on mobile ensures that there is room for more interactive and memory-intensive features such as visualizations. Mobile devices are likely used for quick reference, and while access via mobile needs to be available, it does not have to be a priority from the point of view of upgrades to the UX/UI.

Implications

Engineers who use standards as part of their professional routine tend to access their information sources daily, but likely outside the PLM environment if they are using one. The information they access is likely to be managed through a corporate library.

However, upon discovery, users tend to download information to share via external channels, even when sharing with colleagues. While most subscribe to their mission-critical content, a large cohort uses peer networks for obtaining it or supporting the discovery process. Compared to our study of information consumption practices of engineers with a focus on workflows, there appears to be less reliance on interactive and collaborative features when it comes to users of standards.

Besides established routines and legitimately efficient practices, the reason is likely the prevalence of legacy formats in the standards development industry. As a result, users of standards are more likely to establish a distinct workflow routine for accessing and applying their mission-critical content. When it comes to the modification of content or use of data in modelling and updating derivative documents, most has to happen manually, raising concerns of inefficiency and inaccurate data transfer. From the perspective of nurturing the relationship with the user, residing outside the workflow process limits the number of touchpoints a publisher is likely to have with the user throughout the lifetime of a project.

Our research did not specify standards as a sole focus, so the findings apply to all data sources selected by the respondents. However, Outsell's research reveals that standards developers have identified being "the best-kept secret" of their markets as a concern and a potential risk to their longevity as member-based organizations. They highlight that using standards as a resource at the inception would introduce efficiencies and potentially shorten development cycles. Better integration into workflows and accessibility as a point of reference will raise the profile of standards with the engineering community and extend their usage beyond expert users to young professionals and corporate researchers in the earlier stages of product development.

On the bright side, there is a lot of ground to be gained for publishers who recognize usage practices and adapt to them to minimize undesirable long-term side effects, such as disengagement of users or rampant unlicensed usage. For those companies that maintain advanced in-house knowledge management environments, a value-add would likely translate into minimizing the reformatting required to ingest a publisher's content into their corporate libraries. Our research reveals that in such cases, information vendors need to be prepared to deliver a certain degree of customization of their offerings to ensure the full benefit of integration to their clients. Understandably, this route is reserved for larger accounts.

As to the approximately 20% of users who log into a publisher platform for accessing and sharing information, publishers need to increase this cohort and fight attrition. Improving discovery appears to be a low-hanging fruit that will help address multiple access and application issues.

In addition, frequent usage and the variety of information sources mean that there is an unlimited opportunity for publishers to strengthen their positions as suppliers of mission-

critical, highly relevant content for their users, most of which can be curated from third parties or created in partnership with them. We also see an opportunity to grow the bond with the user via nurturing a professional community centred on a publisher's proprietary content.

Essential Actions

There is a lot of room for growth in serving users of standards, with multiple avenues to follow, from improving user-centric features to customizing information delivery to work seamlessly with the client company's internal libraries. We have identified the following next steps for information vendors seeking to create a more attractive product.

✓ Focus on Super-Users

We suggest that publishers focus on the over 30% of users who access their content daily and tailor their products to the needs of this cohort. Such a focused approach may lead to reductions in the scope of materials offered, changes in the licensing, or a new marketing approach. It is worth the effort to get to know this cohort better since market segmentation of engineers as a target audience presents a challenge due to its highly fragmented nature. Super-users will indicate the most pertinent material, the most effective marketing tactics, and potentially the most prevalent workflows to adapt the content to. At 30%, this is a large enough group of users to serve as a proxy for the rest of the market.

✓ Perfect Discovery

Perfecting the search function needs to be on the top of information providers' UX/UI agendas since poor search capabilities have implications beyond discovery. As we have shown above, users both share and receive documents via peer networks. While in some cases this activity may be legitimate, publishers need to minimize the incentive for users to share and request information via peer networks as a substitute for sophisticated search through a publisher platform.

✓ Ensure That New Products are PLM Friendly

Documents constitute only one component of a workflow, and the low level of PLM usage among users of standards sounds an alarm. Workflows are increasingly digital, and the low single-digit growth rates of PLM tools projected by industry analysts signify the high maturity of this market. Information providers and standards developers need to address the issue of inefficiencies when it comes to content compatibility with PLM

environments to foster collaboration, especially against the background of “remote engineering” in the post-pandemic workplace.

✓ **Add Value by Offering an Additional Type of Content**

Our respondents show a great variety of interests in their information diets and an appetite for different types of content they would consider mission-critical and use at least weekly. Curating such content for the user is a value-add in the environment of information overload and offers another way for information providers to stay relevant.

Publishers need to use this opportunity to keep the attention of the user on their platforms. Industry news, vendor presentations, training materials, and data visualization are types of content that can be supplied by third parties, with publishers acting as vetted channels and limiting the number of resources that engineers need to monitor to stay up to date in their fields.

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