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Measuring Design and its Role in Innovation

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MEASURING DESIGN AND ITS ROLE IN INNOVATION

Fernando Galindo-Rueda and Valentine Millot

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ABSTRACT

This working paper sums up the main findings of an OECD project aiming to provide an evidence basis for focusing efforts to improve the measurement of technological and non-technological forms of business innovation, with particular focus on the role of design.

The paper reviews a broad range of novel design-related measures, indicating their advantages and limitations in terms of policy relevance and insights. The analysis of design provides a valuable test-case for assessing the robustness of the overall framework for measuring innovation as proposed in the OECD/Eurostat *Oslo Manual*. This report identifies a number of areas for potential development in future revision, focused on the role of users and the implementation of the definition of innovation and innovation activities. It also identifies a range of design concepts based on an informal consultation with the design expert community.

This report illustrates a number of findings arising from the first-time use of a set of experimental and optional questions on design implementing a "ladder-type" model of design which describes levels of sophistication and integration of the design function within the firm. Cognitive testing and analysis of the microdata from a large and representative sample of Danish firms shows a high degree of respondent acceptance of the experimental questions and supports their predictive validity *vis à vis* a number of hypotheses on the use of design and a series of innovation and economic outcomes potentially associated to it.

Keywords: design, innovation, measurement, technology, surveys

ACKNOWLEDGEMENTS

This working paper presents the results of a project on the measurement of design and innovation carried out under the auspices of the Working Party of National Experts on Science and Technology Indicators (NESTI) within the CSTP Programme of Work and Budget for the 2011-12 and 2013-14 biennia and as part of the NESTI activity to review the measurement frameworks for R&D and innovation. The project has benefited from voluntary contribution grant funding support from the European Commission, as part of a collaborative partnership agreement between the OECD and DG Enterprise and Industry, the EC-OECD Partnership on Innovation (EU Contribution Agreement SI2.600395).

This paper draws on input from Brunella Boselli and Vladimir López-Bassols on the measurement of innovation and the contribution of Mariagrazia Squicciarini and Marie Le Mouel on skills and competencies-based measures of design. Ray Lambert, who as a former NESTI Bureau member brought this topic into the NESTI roadmap and, along with Ruth Flood and Danielle Campbell from Madano Consultants, contributed to this work with an analysis of design concepts for measurement, implementing an online-based consultation and summing up the results. Helle Månsson and Jens Brodersen from Statistics Denmark provided an invaluable contribution to this project, by implementing the OECD analysis of innovation and custom design micro-data for Denmark and assuring the non-confidentiality of the OECD results.

NESTI delegates provided valuable inputs throughout various stages of the project, including a presentation of interim results at the NESTI meeting in April 2013. Delegates from Belgium, Portugal, Sweden, the United States, and their teams contributed to the testing of innovation concepts with firms in their countries and shared their results with the OECD.

The collaboration of Eurostat and the participants and consultants engaged in its Community Innovation Survey Task Force is gratefully acknowledged. Likewise, the contribution of expert participants at the OECD workshops on measuring investment in intangibles (March 2012) and measuring design (February 2013) and a workshop organised by DG Enterprise and Industry (February 2014) is also acknowledged. The OECD secretariat also wishes to thank Isabel Roig and the Barcelona Design Centre for their kind hosting in May 2011 of a seminal workshop that helped link different communities with an interest in design measurement at an international level, as well as comments received from Fred Gault, Svein Olav Nås, Giulio Perani and Antti Valle, who was the project officer for this project.

This working paper has been prepared by Fernando Galindo-Rueda and Valentine Millot from the Economic Analysis and Statistics Division at the OECD Directorate for Science, Technology and Industry. Any errors are the sole responsibility of the authors.

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EXECUTIVE SUMMARY

1. The OECD standards for measuring policy relevant to science, technology and innovation phenomena have been in constant evolution to incorporate emerging user needs, reflect the changing nature of innovation and address known conceptual and practical challenges. This report sums up the most relevant findings from work carried out, principally but not exclusively, under the auspices of the OECD Working Party of National Experts on Science and Technology Indicators, to explore how the measurement frameworks capture the broad range of innovation activities in firms, as recognised in the OECD Innovation Strategy, and in particular, how design activities are reflected.
2. The purpose of the work is to identify evidence and potential strategies to improve the measuring of design and of innovation more broadly. This is intended to ultimately feed into the ongoing revision of the OECD *Frascati Manual* on R&D, inform a future review of the OECD/Eurostat *Oslo Manual* on innovation, as well as contribute to other statistical and analytical activities in this area at the OECD and elsewhere.
3. The review work carried out as pa**r**t of this project shows there already exist a broad range of design-related indicators, each with its own advantages in terms of policy relevance and insights. These also have a number of built-in limitations in scope which indicate they should be used in conjunction with each other rather than in isolation:
   - New measures of **outputs and inputs** for specialised design sectors that provide their "design" services to other business and consumers – for example, in the European Union, the specialised design sector accounts for EUR 8.8 billion of gross value added, compared with the much larger and also design intensive engineering and architectural services sector of EUR 126 billion;
   - New measures of design-related **skills and tasks** in the workforce, which can use auxiliary information on the design content of occupations and labour force data. Nearly 5% of the US workforce are employed in design-intensive occupations, while Denmark, Finland and Italy have the largest shares of design-related workforce in relation to the overall "knowledge" workforce among the countries for which data are available.
   - Measures of registered designs capture a specific, formal dimension, of design. They co-exist with the wider **intellectual property** (IP) portfolio and broader strategies used by firms to protect their design and innovation activities, and provide a basis for analysing a number of policy-relevant questions.
   - Ad hoc surveys on design **activities and expenditures** have been used in specific cases, either as stand-alone or as part of innovation surveys or new surveys on business investment in knowledge-based capital (KBC), which have been implemented with some degree of success in the United Kingdom and more recently in Italy.
4. The analysis of design provides a valuable test-case for assessing the robustness of the overall framework for measuring innovation as proposed in the *Oslo Manual*. This framework experienced a significant development in its 2005 revision as it expanded the definition of innovation to incorporate a number of organisational and marketing innovations to better capture the broad range of innovations carried out in the economy, particularly in the service sector. The revised manual also parted with the traditional separation between technological and non-technological innovations and paved the way to consider the novelty of product and process innovations on the basis of the attributes, not necessarily technical, but functional, of the innovations introduced by business.

5. Results from innovation surveys have repeatedly shown that the two broad types of innovation (product and process on the one hand and organisational and marketing on the other) are more likely to co-occur than take place in isolation. Furthermore, cognitive interviews with business managers in several countries have revealed difficulties among respondents in separating between some types of innovations, in particular between process and organisational innovations. New research evidence also shows how the choice of survey instruments and methodologies has a particularly strong impact on the response behaviour of business managers presented with innovation surveys. This can help explain some of the apparent inconsistencies arising from international benchmarking exercises of innovation survey data which underpins some of the existing reluctance to use innovation surveys to inform policy making. Cultural factors, particularly in relation to whether an innovation has to be successful, after it has been introduced in the market – the definition of innovation in the Oslo Manual requires only contact with the market regardless of success – also appear to play some role in driving international differences, but it is so far impossible to quantify the size of such an effect. The OECD has recently begun disseminating those indicators and their metadata (www.oecd.org/sti/inno-stats.htm), drawing particular attention to these methodological aspects and their implications for users.
6. Measurement of design has fallen short of the expectations raised within the *Oslo Manual*, as practical implementation solutions for dealing in particular with design as a distinct type of innovation activity supporting the introduction of new products and processes did only come to fruition in very few countries and have only been incorporated in the core questionnaire of the Community Innovation Survey in 2012, after several rounds of testing. This has led to new designs and some design changes being viewed in practice by the surveys in the narrow sense of marketing innovations that change the appearance and feel, but not the function, of existing goods and services.
7. It has not been possible either to propose implementable guidelines for surveys allowing firms to identify their design expenditures for innovation separately from other or potentially overlapping innovation activities such as R&D and software. As concluded from cognitive interviews, it is not possible for business in general to draw a line in their accounts between innovation with its first time implementation and ongoing use of the innovation. An experimental approach to attempt to separate between development and implementation – to at least retrieve the overall innovation development efforts – did not prove successful in cognitive interviews. It does however seem feasible to attempt to collect information on knowledge-based activities, either in financial or human resource terms, with some level of functional detail, including design, but without necessarily requiring an explicit link with innovation.
8. This report illustrates a number of findings arising from the first-time use of a set of experimental and optional questions on design by Statistics Denmark in its 2010 innovation survey. The questions provided a practical implementation of a "ladder-type" model of design which describes levels of sophistication and integration of the design function within the firm. The micro-data became the object of a quantitative analysis case-study by the OECD Secretariat in collaboration with Statistics Denmark. This showed a high degree of acceptance of the questions by respondents and their predictive validity *vis à vis* a number of hypotheses on the use of design and a series of innovation and economic outcomes potentially associated to it.
9. Overall the results of the analysis tend to support the validation of this "ladder" model:
    - Around one enterprise out of four reports using design, either with the sole purpose of providing a last finish on products (5%), as an integrated though not determining element (10%) or as a central and determining element (8%) in their activities. The sectors showing the highest propensity to integrate design are high-tech manufacturing sectors, followed by ICT services, other professional business services and lower and medium tech manufacturers with a focus on consumer products.
    - The use of design as an integrated element is highly correlated with innovation outcomes, particularly product and marketing innovations, including new-to-market innovations. Controlling

for observed firm characteristics, the probability of introducing a product (marketing) innovation is 24 % (31%) higher for firms where design is integrated.

- Design integration tends to have a positive effect also on the success of innovative products. On average the percentage of innovative turnover of product innovating firms is nine times higher in firms using design as an integrated element.
- The use of design as an integrated element is highly correlated with measures indicating the implementation of methods of user engagement such as consumer panels and other advanced methods, thus lending support to a "user centred" view of design.
- The use of design as an integrated element is found to be significantly related to other innovation activities, both internal and external. Design integration generally reduces reliance on external product development, except for firms where design is a determining element, which rely heavily on external R&D and often co-develop their innovations with other partners.
- Robust correlations are found between design use and firm's economic outcomes, especially value added and productivity growth. Firms using design as an integrated element are found to have on average a 9.1% higher employment growth rate, a 18.7% higher value added growth rate and a 10.4% higher productivity growth rate than similar-sized firms within their own sectors over the three-year period covered by the survey.
- The estimated 'impact' of design on those economic outcomes is robust to the inclusion of indicators of innovation and R&D, suggesting that design can be a useful predictor of performance and pointing to the importance of understanding what are the causal mechanisms at work.

10. An informal survey-based consultation with the international design community was carried out to help identify which were the main design concepts to consider for proposing avenues for measurement. Based on a 13-item list of statements on the role of design with regards to innovation, it was possible to uncover through statistical analysis three main underlying themes indicating how design was viewed by practitioners, by decreasing order of relevance to respondents:
    - **Design as a user-centred, creative development activity driving innovation**. To some extent, this represents an inversion of the linear model of innovation, where usage considerations drive creative efforts to ensure the implementation of ideas as potentially radical innovations. This dimension highlights the role of design integrating the development and implementation of innovations. A tentative definition that might emerge from this rather broad perspective would overlap with the D (experimental development) in R&D as currently measured.
    - **Design as a link between the innovation activity of the firm and the market**. This dimension galvanizes the role of design described in the *Oslo Manual* as a key activity in the preparation of product and process innovations, and in efforts to modify the appearance and perception of existing goods and services. This dimension thus highlights the common factors that underpin the ability to bring to the market new or existing products and integrate the functions and the aesthetics into a combined offering. This factor does also match rather closely the context in which the term design is frequently used in non-English speaking countries.
    - An **organisation or business capability**, with an emphasis on the skills resources and strategies required for innovation which are currently underplayed in the *Oslo Manual*. This brings together concepts of design as a set of skills, in-house or outsourced, and as enabling efficiency in production and use in strategic decision making. The implication is the integration of design into core business operations.
11. On the basis of these responses, it is somewhat reassuring that innovation surveys can be used to provide an approximation to the second and third concepts of designs set out above, in particular by :
    - moving towards a satisfactory treatment of the novelty of attributes underpinning innovations;
    - making explicit the role of design in product and process innovations;

- implementing broad ranging improvements to survey methodologies to avoid the explicit or implicit association with R&D-based forms of innovation; and
- including questions of broad applicability for innovating and non-innovating firms, on knowledge-based activities and resources, where the design ladder-type questions can be easily accommodated.

12. The first concept of design as a broad ranging user-centred development activity is insightful in its integration of development and implementation and the integration of users and producers. However, from a measurement perspective it is particularly more challenging, and as a result will likely require combining a range of different measurements through existing and new data sources and analytical efforts.
13. Finally, it is apparent that identifying potential mechanisms for measuring design and producing indicators will not by itself satisfy the needs and expectations of policy users. Potential questions concern estimating the private and social rate of return to design investment, the extent of spillovers from design activities, the most appropriate protection frameworks for design outputs, the case of or against financial reporting requirements, the relevance of raising awareness on design and developing links with the design community, or the potential promotion of design skills and capabilities in firms, the workforce and youth. Dealing actively with these questions requires an ambitious research agenda. Identifying and addressing data gaps is a necessary step, which must be supported by the legal and physical infrastructure that provide the means for linking data sources and policy experiences in an analytical setting. This agenda requires first and foremost a continued dialogue to identify the most crucial questions of interest for policy makers and how they can be tested empirically.

MEASURING DESIGN AND ITS ROLE IN INNOVATION

1. Background and objectives: improving the measurement of innovation to meet user needs

This brief sums up the main findings of recent work by the OECD Working Party of National Experts on Science and Technology Indicators (NESTI) on measuring design,[1] as part of efforts to improve the measurement framework for innovation as based on the *Oslo Manual* (3rd edition, OECD/Eurostat, 2005) and in the surveys run by OECD countries and beyond. NESTI initiated in 2010 a combined review of the measurement frameworks for R&D and innovation, intended to provide evidence and suggestions for potential improvements to be considered in future revisions of the Frascati (OECD, 2002) and Oslo Manuals on R&D and innovation, respectively. While a revision of the former was formally started in 2013 and is expected to be complete in 2015, the process leading to the revision of the *Oslo Manual* is expected to begin in the same year, starting with a review of the implementation of the changes introduced in 2005, as well as an exercise taking stock of new, more experimental approaches, aimed at addressing gaps and user needs identified as part of the 2006 OECD Blue Sky Forum (OECD 2007) and the measurement agenda introduced in the 2010 Innovation Strategy and its Measuring Innovation monograph (OECD, 2010ab).

NESTI has undertaken a series of activities and projects to build up an evidence base to support this review work including: (a) a study of innovation in services and service innovation across the entire economy [www.oecd.org/sti/innoserv]; (b) work on the measurement of knowledge flows and linkages in the innovation system (OECD 2013d) [www.oecd.org/sti/knowledge]; (c) the systematic collection and dissemination of innovation survey indicators and metadata [www.oecd.org/sti/inno-stats.htm]; (d) a study on the scope for measuring innovation in the public sector; (e) proposals for measuring the role of public procurement and demand as a driver of business innovation (Appelt and Galindo-Rueda, forthcoming); (f) work to promote the cognitive testing of innovation survey concepts, definitions and questions across different OECD countries (Galindo-Rueda, forthcoming); and (g) a project focused on improving the measurement of non-technological forms of innovation, with particular emphasis on the role of design.[2] The project has been informed by an internal review of measurement approaches, consultation with the design community, cognitive testing, empirical analysis of experimental data, discussions at NESTI and the Eurostat meetings hosted by the OECD and the European Commission's DG Enterprise and Industry.

1. The NESTI programme of work on measuring design has been carried out with support from a voluntary contribution, grant funding support from the European Commission, as part of a collaborative partnership agreement between the OECD and DG Enterprise and Industry, i.e. the EC-OECD Partnership on Innovation.

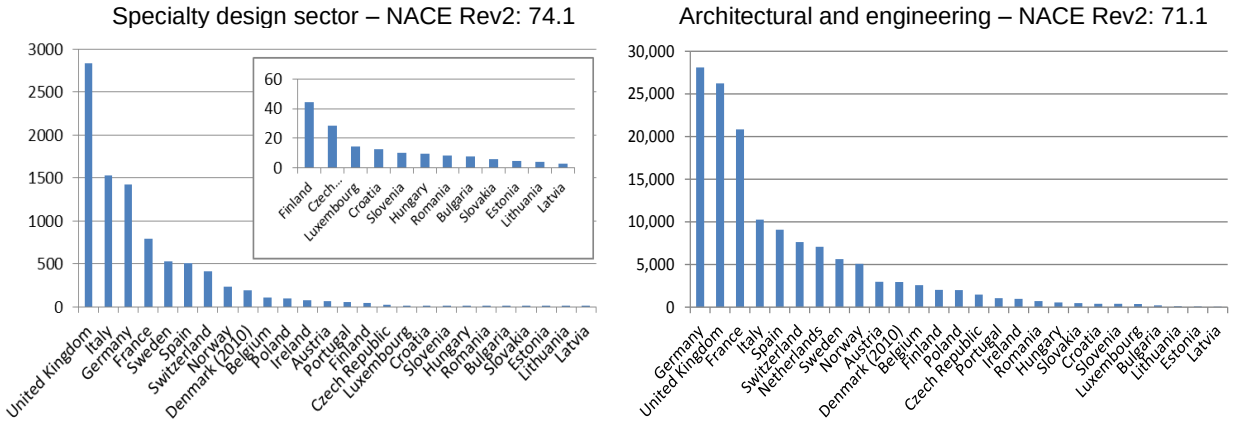
2. Through these and related activities, NESTI has also been engaged in work on measures of business investment in knowledge-based capital (KBC), along with the WPIA, as part of an OECD horizontal project led by the CIIE, www.oecd.org/sti/ind/newsourcesofgrowthknowledge-basedcapital.htm.

2. Review of measures of design

2.1. Measures of design as an industry

The newly adopted industrial classification systems enable a more accurate assessment of the economic activities of firms engaged in design-related activities as their main line of business. For example, the new International Standard Industrial Classification and European Industrial Classification (ISIC Revision 4 and NACE Revision 2, both adopted in 2008) support the production of data on turnover, value added and employment for the specialty design sector (ISIC Rev4 and NACE Rev2 741). This covers fashion design, industrial design, activities of graphic designers and interior decorators but excludes the design and programming of webpages, architectural design, engineering design and theatrical stage-set design. Among European countries, the United Kingdom has the largest specialty design sector in gross value added terms, according to structural business statistics reported in **Figure 1**, followed by Italy, Germany, France and Sweden. But this is clearly not the sole sector that produces design outputs as main product. The engineering and architectural sector (NACE Rev2: 71.1) is approximately ten times the size of the design specialty sector. Germany is the country with the largest engineering and architectural sector in value added terms. A clear limitation of this type of measures is that they fail to capture the in-house design activities that non specialist firms often carry out, for example within the manufacturing sector where designers work in separate teams or alongside engineers and other professionals.

Figure 1. Gross value added in two design related sectors, 2011, in million EUR[3]



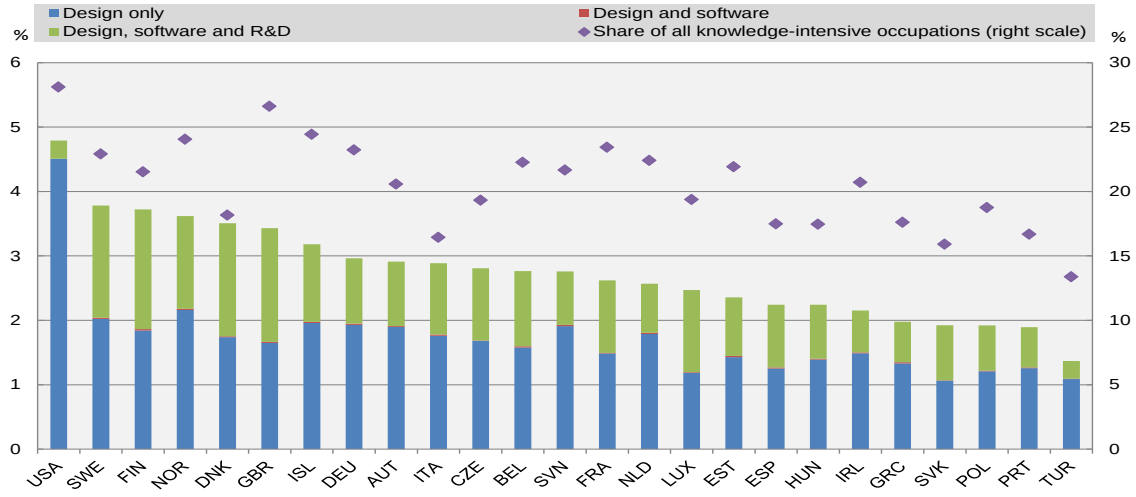
Source: OECD, based on Eurostat. Annual detailed enterprise statistics for services (NACE Rev. 2). Extracted February 2014.

2.2. Measures of design as workforce skills and tasks

The literature on intangible investment provides a relevant example of how industry and occupational data can be combined to identify investment activities carried out in-house for own use. For example, national account estimates of software investment identify software development professionals and extrapolate from their employment costs the overall efforts made by industries using input-output data from the specialty sector. In the case of design, a similar approach is feasible in principle, but first requires identifying the design content of different occupations (Galindo-Rueda et al., 2010).

3. The figures are based on Eurostat figures and thus presented according to the NACE Revision 2 classification which is derived from the ISIC Revision 4. The two classifications are identical at the 2 digit level, and the groups and classes at the third and fourth levels of NACE. Revision 2 can always be aggregated into the groups and classes at the same level of ISIC Revision 4. Sectors 74.1 and 71.1 cover the same activities in the two classifications.

Figure 2. Design and overall KBC-related workforce, as a proportion of employed population



Source: OECD analysis, 2013 , based on United States Occupational Information Network Database, O*NET OnLine United States Current Population Survey, US Census Bureau; and European Labour Force Survey, Eurostat, June 2013.

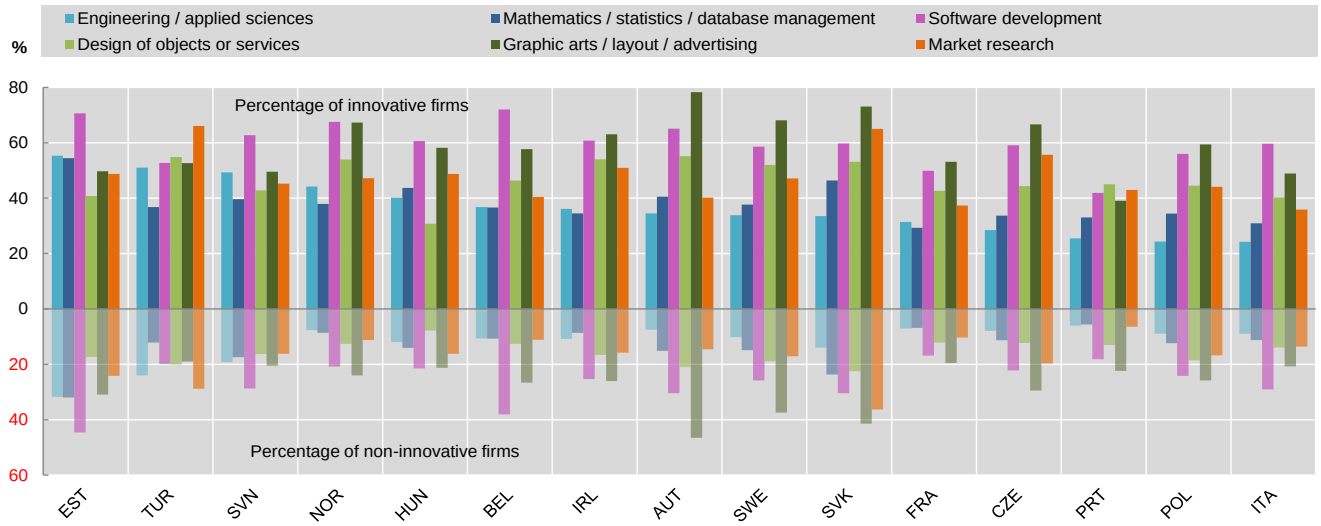
Note: Occupations related to KBC are defined on the basis of tasks performed, skills and knowledge areas, using the United States Occupational Information Network (O*NET) Database. Occupations are defined according to the Standard Occupational Classification (SOC, 2010, http://www.bls.gov/soc/) for the United States and to the latest International Standard Classification of Occupations (ISCO, 2008, see ILO, 2012) for Europe.

Unfortunately, there are few sources of information on what knowledge workers and employees in general do in their jobs. One relevant potential source of data on the design content of occupations is the U.S. Occupational Information Network (O*Net) database by the U.S. Department of Labor. This dataset contains a wealth of survey-based information about workers' main characteristics and requirements, and about experience and occupational requirements. **Figure 2** shows results based on OECD work (see for example Squicciarini and Le Mouel, 2012 and 2013), indicating a considerable degree of overlap in design, software and R&D content in occupations. While the United States has the largest share of design-related workforce, Denmark, Sweden, Finland, and Italy have high shares of design related occupations relative to their domestic share of workers engaged in activities likely to result in increased knowledge-based capital (KBC).

The taxonomic description of occupations in O*Net can support a range of analyses on the use of design, combining information on job abilities (e.g. cognitive and sensory abilities); knowledge requirements (which include design, engineering and technology, arts and sociology, to give some relevant examples); skills (e.g. critical thinking, complex problem solving, technology design); work activities and tasks including mental processes (e.g. creative thinking, visual outputs), and also work values and contexts (e.g. artistic, investigative, etc.). Different weights can be placed on each of these elements to identify which occupations are more design-intensive. In this line of research, it would be particularly important to identify to what extent similar occupations in different countries differ in their design content.

An example of a complementary approach is available in the 2010 Community Innovation Survey, which included a set of optional questions on whether firms use a set of specialised skills, either as employees or through external contractors, namely graphic arts, product or service design, multi-media or web design, software development, engineering and applied sciences and mathematics or statistics. While not exhaustive, these items provide a useful picture about how firms rely on different competences. Analysis of results published by Eurostat in **Figure 3** shows the widespread use of software development and graphic arts/advertising skills compared with design and other skills. Results also show a significant difference in the proportion of firms using different types of skills according to their innovation status.

Figure 3. Firms using innovation-relevant skills, 2008-10
As a percentage of innovative and non-innovative firms



Source: OECD Science, Technology and Industry Scoreboard 2013 based on Eurostat, Community Innovation Survey Database, July 2013.Doi: 10.1787/sti_scoreboard-2013-graph78-en.

Note: Estimates are based on the voluntary, ad-hoc module in the EU Community Innovation Survey 2010 on the skills available in enterprises and on methods to stimulate new ideas and creativity[4]. The indicator corresponds to the percentage of firms in the relevant innovation category responding affirmatively to the question: "During the three years 2008 to 2010, did your enterprise employ individuals in-house with the following skills, or obtain these skills from external sources?"

2.3. Measures of design as intellectual property (IP) rights

Available indicators of design rights indicate a very rapid increase in design registrations over the last 30 years in China, Korea and the United States as well as the OHIM since its creation (WIPO, 2012, 2013). However, recent OECD analysis on the IP bundle of the 20 largest IP applicants at the European level – looking at patents at the European Patent Office (EPO) and trademarks and designs at the Office for Harmonisation in the Internal Market[5] (OHIM) – shows that designs are the least used type of protection applied for[6], although relative shares vary significantly across countries (OECD, 2013a). Design rights actually have very specific legal features and implications, protecting the form or appearance of physical products, not the function. This implies that more broadly defined design can be protected by other forms of IPRs.

Furthermore, design protection is not currently harmonised across jurisdictions, and the level of protection can vary significantly across national jurisdictions. The TRIPS agreement, although providing some recommendations on the requirements of design protection, e.g. regarding the novelty and originality, do not provide any definition of industrial design or what kind of object is eligible to design protection. Notable differences are found between US and EU legislations, design protection being considerably quicker and cheaper in the latter (Schickl, 2013). This may explain why the United States has one of the highest non-resident share of design registrations creation (WIPO, 2012), which could pertain to a lack of awareness on design protection by US residents.

4. http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/documents/CIS_Survey_form_2010.pdf

5. European Office for trademark and design registrations.

6. It should be noted that there are differences in the territorial coverage of EPO patents and OHIM trademarks and registered designs. EPO patents can be registered in one or more contracting states (38 since 2010), whereas OHIM trademarks and registered designs have a unitary character in European Union countries and their geographic scope cannot be restricted.

2.4 Design as an element of innovation and innovation activities

The third edition of the *Oslo Manual* in 2005, in moving to integrate marketing and organisational innovations, maintained a distinction with product and process innovations, previously described as *technological* product and process innovations, as such was the focus of the first (intended for manufacturing firms only) and the second edition (which extended its coverage to services). This new taxonomy maintained the largest possible degree of continuity with the previous definition of technological product and process innovation used in the second edition of the Manual, but the category of and references to technological innovation disappeared (Gault, 2013). Product and process innovations are indeed closely related to the concept of technological product and process innovations, but the focus clearly shifted in the revision to allow for non-technical innovations within those categories. In the case of products, this opened up the coverage by allowing for improvements in user friendliness and other functional characteristics, a feature of particular relevance to services.

Box 1. What is the *Oslo Manual*?

In short, the *Oslo Manual* provides a conceptual and practical framework for the collection of statistical data and the analysis of innovation in firms. It was first published by the OECD in 1992, focusing on the so-called "technological product and process innovation" in manufacturing, the result of a co-ordinated effort between academics and statisticians and the OECD through its NESTI, with the input of the European Commission through the launch of the first Community Innovation Survey (CIS). The manual has been co-produced and co-managed with Eurostat since its second edition (1997), when it was extended to services. It is developed and reviewed through peer process by NESTI and the Eurostat Working Group on S&T Indicators. As a statistical manual, it is also reviewed by the OECD Committee for Statistics, which approved the third revision in 2005, when the definition of innovation was extended to incorporate the introduction by a business of new organizational or marketing methods, i.e. what used to be described as "non-technological" forms of innovation, also including the treatment of linkages as another major development.

The *Oslo Manual* has the following features:

- The manual's conceptual underpinnings build upon an economic framework which draws from Schumpeter, evolutionary economics and the systems of innovation literature, aiming to map the processes that underpin the creation and diffusion of knowledge.
- Its methodological approach is focused on describing aspects of the innovation activity of the firm as a whole (the subject), rather than describing individual innovations or innovation projects (object approaches).
- It focuses on the introduction of innovations in the marketplace, understood as either products being brought to the market or processes and methods adopted by firms that operate in the market. The manual characterises the activities that support these innovations and the factors and conditions in which firms undertake such activities.

The manual provides definitions and recommendations for developing and implementing surveys, but it is worth noting that it is *not* a survey template or list of indicators. It is as a result implemented in different ways across countries, shaped by specific national interests and constraints. The CIS, which is conducted every two years in more than twenty European countries, draws upon a harmonised core questionnaire across all the participating countries, which enables a certain degree of core indicator comparability.

The revised taxonomy of innovations in the *Oslo Manual's 3rd edition* led to design being captured: (a) As one of the possible activities potentially used by firms, alongside activities such as capital investments and R&D and broader development efforts, to assist the introduction of new products and processes.[7] (b) Within the category of marketing innovations, encompassing changes in design that only impact on the appearance, not the functional performance of products. Such design changes are excluded

7. Design features as part of the broad, residual and not particularly illuminating category of "Other preparations for product and process innovations" when it covers "activities aimed at planning and designing procedures, technical specifications and other user and functional characteristics for new products and processes" (Oslo Manual para 334). The potential overlap with R&D is also noted, indicating that in such cases, relevant elements should be included as R&D consistently with recommendations in the *Frascati Manual*.

from the definition of product innovation. However, due to the lack of widespread agreement on the desired practical approach to capture the former, the measurement of design has become in practice dissociated from the concept of product or process innovation and instead has been more associated with the concept of marketing innovation, as reflected by the comments of expert participants at recent workshops on this subject.[8] This reflects the importance and difficulty of bringing into practice concepts and definitions contained in manuals. This gap was clearly identified and widely discussed at the OECD Blue Sky Conference in 2006 (OECD, 2007; Vinodrai, Gertler and Lambert, 2007; OECD, 2010b).

Until recently, it has proved impossible to reliably capture the role of design as an activity underpinning the practice of product and process innovation into practice across a majority of countries, even as a simple qualitative indicator. Respondents viewed design in different ways, and given the overlap with R&D and other innovation activities, it has been very challenging to develop questions which elicit information specifically on design. An approach was adopted with relative success in the UK's innovation survey, but for a number of years, several rounds of cognitive testing for the model CIS questionnaire – reviewed by Eurostat and the CIS Task Force – failed to identify a common formulation which drew wide support. A variant to capture whether firms undertake design activities in the context of product and process innovation – without eliciting information on expenditures – was finally agreed for the 2012 survey, for which results are not yet publicly available. The release of these data will likely support the type of analysis (Haskel et al, 2005; Tether, 2005[9]), linking measures of design, innovation and economic performance.

2.5. Measures based on direct enquiries on design efforts

A wave of recent studies has collected information on design expenditures regardless of the association with innovation. Examples can be found in the work by Moultrie and Livesey (2014) for the United Kingdom, on behalf of its Design Council, which was entirely focused on design. Other work has been implemented in the framework of collecting measures of *intangible investment*, or as more recently described in OECD work, *investment in knowledge-based capital*, based on the proposals of Corrado, Hulten and Sichel (2005) to use an extended National Accounts capitalisation framework for intangibles.[10]

Examples include the ONS-NESTA surveys with reference years 2008 and 2010 (Field and Franklin, 2012; Awano et al., 2010), the EU Innobarometer – a flash survey of European firms – (EC, 2013)[11], the Italian ISTAT-ISFOL pilot study (Perani and Guerrazzi, 2012) and their more recent full survey, the results of which are about to be published. This approach is in principle easier for firms to

8. Thus, the implementation of the *Oslo Manual* makes it impossible to operationalize the first of §162. "Design is an integral part of the development and implementation of product innovations. However, design changes that do not involve a significant change in a product's functional characteristics or intended uses are not product innovations." This is often perceived as a contradiction.

9. These studies supported a national policy review on creativity in business (Cox, 2005), which was also supported by review and conceptual work by Swann and Birke (2005).

10. The revision of the System of National Accounts (EC et al., 2009), which allows the treatment of not only software but also R&D as capital formation (OECD, 2010c), leaves an open door to capitalising some design expenditures as "Other intellectual property products", but only a few countries are considering this and in a satellite, rather than core, set of national accounts.

11. The survey , conducted at the request of the Directorate-General for Enterprise and Industry, was carried out by TNS Opinion & Social network, under the coordination of the Directorate-General for Communication ("Research and Speechwriting" Unit) and with technical support and contributions from the Joint Research Centre of the European Commission. The survey covers a realised sample of 11,317 firms sampled from a population of several millions of enterprises with more than one employee from 36 countries. It was implemented via a Computer-Assisted Telephone Interview (CATI) methodology.

handle, as it does not require respondents to make informed or heuristic assessments about the innovation component of design or other items, but on the contrary requires entering additional details to ensure companies report not only purchases but also in-house activity. Information on the use life of design is required for the purpose of mapping gross investment figures into stocks.

Box 2. Categories covered in the ONS-NESTA Survey of Investment in Intangible Assets

- **Employer Funded Training:** Employer funded training of the business's staff, whether provided by an external organisation or its own personnel. For example, training on IT systems, new production equipment, ISO accreditation, skills development **– asks for days of training per employee**
- **Software**. Purchase of external software and development of software in-house. For example, operating systems, general purpose office applications (e.g. word processing), special purpose applications (e.g. financial accounting systems, databases, production control systems), etc.
- **Reputation and branding.** Work intended to enhance reputation or brand values, either of the **business as a whole or individual products or service lines.** For example, product launches, promotional campaigns, the 'rebranding' of business, development of promotional materials, etc.
- **Research and development work**. This is described in the ONS-NESTA survey as "Original investigation to acquire new knowledge to resolve scientific or technological uncertainty. For example, prototype development and testing, phase 1 to 3 clinical trials, etc...". This departs from the OECD core definition by placing more emphasis on the FM guidance to distinguish R&D from other activities (FM, para 84).
- **Design** - the design of products or services to improve their look or performance. Exclude design of scientific prototypes (part of R&D) and design of software.
- **Business process improvement**: Work on improving the efficiency and effectiveness of the business. For example, quality improvement programmes, business transformation projects, strategy development and implementation, culture change projects, etc. Excludes software spending included costs of bought-in management consultancy services managers working to improve general business processes associated costs, including office facilities and overheads for staff involved but not capital items. Estimates based on proportions of staff time are acceptable.

Source: ONS-NESTA Survey of Investment in Intangible Assets. Personal communication with survey authors.

In the United Kingdom (see **Box 2**), the surveys showed that approximately 10% of companies engage in design activities – that is, design activities excluding those qualifying as R&D and software development – with an average expenditure of GBP 50 000 per firm or below, resulting in an estimated GBP 1 billion worth of design expenditure, a similar figure to that generated from innovation surveys. Design, like several other forms of intangible activity such as brand investment, is much more diffused across the private sector than R&D, and much more common across the service sector (Awano et al, 2010; Field and Franklin, 2012). The survey also illustrates that firms consider design outputs to have an average use life of 4 years, compared to 5 years for R&D.

In this type of framework, design has asset-creating properties when the outputs are fundamentally suitable for recurring use in multiple contexts and over time, which the previous survey confirms to be the case on average. This criterion is potentially helpful in distinguishing feature versus other design-related activities, such as engineering or marketing activity potentially associated with innovation, which are likely to have a shorter use life. In order to avoid double counting across other physical or knowledge assets, it is important to note that "design" is likely to be fully embedded in other activities (e.g. cost of production or cost of sales) and will be difficult to identify in isolation.

The fundamental challenge in knowledge asset accounting is to conceive a set of criteria that addresses the potential overlap and complex input-output relationships between different categories of expenditures, so that the amounts can be consistently compared and added up to a meaningful total. It is well acknowledged that several types of capital goods embody the costs of design inputs. The unique designs for a building or a large ship, for example, are part of the costs that are typically capitalized into the cost of the capital investment associated with these structures. A particular feature of design outputs is

that they can be used and potentially modified for use in the construction of similar buildings or capital structures. They also provide a key input into the maintenance of the asset, extending its usage life.

Table 1. Knowledge assets in the System of National Accounts and design

Recognised assets (treated as investment)	
Knowledge-based asset (2008 SNA, see EC et al., 2009)	**Relationship with design and distinction**
R&D	Not all design meets functional and technical, state of the art and uncertainty tests. A considerable part of the D in R&D shares core features with design. Raises questions of what is design R&D and whether it can be identified.
Software	Development of software originals are by and large another, very distinct type of design. The term design is widely applied.
Databases	Databases with design purpose. Final asset criterion for distinction.
Artistic and entertainment originals	Very close relationship but distinction based on functional dimension.
Mineral exploration	Links with engineering design. Final asset criterion for distinction.
Other intellectual property products	Potential residual category of design. Needs to satisfy a multiple usage/life length criterion to be treated as asset.
Non-recognised assets (not treated as investment)	
Brand capital or marketing assets: Brand names, mastheads, trademarks, logos and domain names. Goodwill.	This can be interpreted as more than just a corporate name or logo, capturing the overall impression a customer or potential customer gains from their experience with the company as a whole and its products. Interpreted in that wider sense it can also be seen to encompass some of the characteristics of goodwill such as customer loyalty. Design efforts can be an input into building up marketing assets. In fact, this is the context in which design is typically mentioned explicitly in existing innovation surveys, relating to marketing innovations.
Organisational capital	The SNA recognizes that the gap between individually identified and valued assets and liabilities - described as “goodwill” – may also reflect the value of corporate structures and the value to the business of an assembled workforce and management and corporate culture, in addition to the ownership of “marketing assets” previously discussed.

Part of the overlap problem between design and other knowledge-based assets is that KBCs are used in the production of other KBCs and are not necessarily bought in the marketplace, but produced internally within the organisation, with or without external inputs. The national accounts framework thus tends to measure the formation of KBC based on their cost of production (if developed in-house) and the method to capture the input of other assets simply captures the services provided by the knowledge asset inputs that contribute to creating the ultimate economic asset, as a form of notional user cost. In practice, this can be particularly difficult to implement, especially as new categories like R&D are accepted in the System of National Accounts (see **Table 1**).

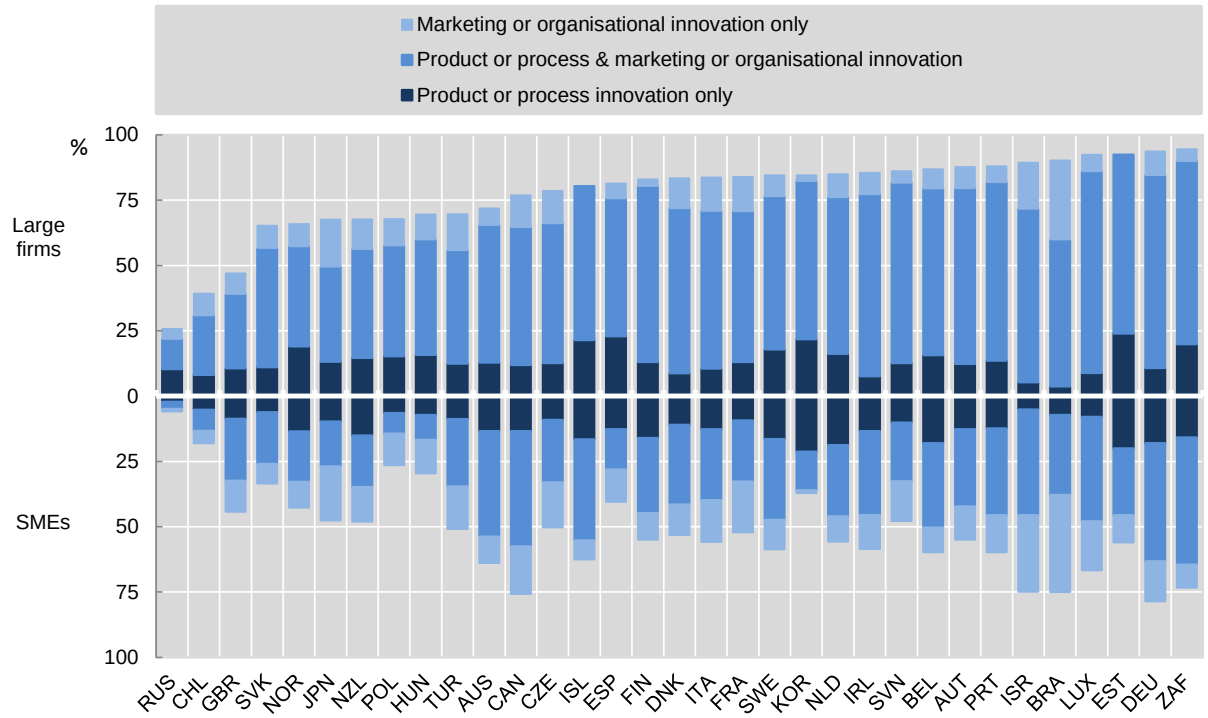
The two main challenges for *ad hoc* surveys on investment in knowledge-based capital are the fact that they have not been widely tested and the concern that there is limited scope for mainstreaming statistical activities at a time of increasing non-response rates and declining resources for statistical activities. It is arguable whether questions on investment in “intangibles” or KBC can be integrated in innovation or structural business surveys. In the case of the latter, it has been noted across a majority of countries that there is a significant degree of under-reporting for investments on own account, particularly for software, which are not automatically registered in the company’s balance sheet. While it appears that companies may be able to provide reasonably approximate responses to such questions, the incentives to do so remain low because financial and accounting systems do not envisage any specific requirements for this information. This leads us to a discussion on how well existing innovation surveys capture a broad range of innovation related phenomena, including design.

3. Design and non-technological innovation in the Oslo measurement framework

3.1. Making sense of data from innovation surveys using the Oslo Manual

Design is part of the innovation activities covered in the Oslo Manual. There has been a rapid and widespread adoption of the proposed OECD/Eurostat standard for measuring innovation, judging by the sheer number of countries that have implemented some type of innovation surveys along the lines proposed in the *Oslo Manual* – more than 80 according to available information. This remarkable degree of adoption has been the result of joint engagement of academics, largely responsible for initial developments, statistical offices, policy users, with the early involvement of the OECD as a standard setting body and Eurostat playing a significant coordinating role. Innovation surveys have provided several valuable insights to policy makers on the nature of innovation, especially concerning the core and universal finding that only a fraction of firms that innovate based their new products or processes on internal or directly externally procured R&D activities (OECD 2009) – a finding echoed in the OECD Innovation Strategy (OECD, 2010a). The framework appears to have been particularly successful in enabling access to and use of the micro-data under secure conditions. A large number of academic papers have been written based on innovation survey data, expanding use beyond a set of pre-defined indicators produced by statistical authorities. This has helped provide particularly valuable evidence on the internal validity and consistency of the data as well as documenting the heterogeneity of innovation practices within firms and the potential reasons (OECD, 2009).

Figure 4. The incidence and pattern of innovation across countries, 2008-2010 or more recent



Source: OECD, 2013 OECD Science, Technology and Industry Scoreboard. For details see wwww.oecd.org/sti/inno-stats.htm

Innovation surveys tend to find that innovation rates (i.e. the percentage of enterprises reporting having introduced an innovation) among large firms are almost twice as high as in small and medium sized firms. They also show that, for all countries, the most common pattern is for companies not to introduce solely a product/process or organisational/marketing innovation (**Figure 4**). In practice, most companies that innovate do both things at once, possibly as part of the same project. This indicates a degree of

integration between what used to be defined as technological and non-technological types of innovation, in which design can be play a significant role.

However, the implied ranking from the aggregate innovation rates raises questions about the validity of the results and the potential for firms in different countries systematically differing in the way they are sampled and report innovation. For example, South Africa, Brazil and Portugal report product and process innovation rates that are significantly higher than for countries with well-developed national science and innovation systems like Japan, United States and the United Kingdom.

Partly as a result of these headline results, innovation surveys have been criticised for a lack of consistency, external validity and comparability across countries, due to differences in survey methodology, survey questions and design (Arundel and Smith, 2013). This has led to major efforts to implement best practices in survey methodology and to update the concepts, definitions and classifications proposed in the OECD/Eurostat guidelines, but innovation policy advisors –an intended user community for evidence contained in innovation surveys – are still to this date reasonably cautious about using their results for international comparisons. It is often difficult to understand why some countries appear to innovate more than others, or more accurately, why companies in certain countries appear to innovate more *on average* than others, particularly in light of other innovation-related and more tested indicators. This raises questions about not only the methodological framework set out in the *Oslo Manual*, but also its practical implementation concerning the survey methodologies and questions used (see OECD, 2007, Chapter 4). In a globalised world where countries look at each other to compare and benchmark themselves, and to learn lessons from their respective policy experiences, the ability to undertake meaningful international comparisons is an important element that shapes the reliance on innovation surveys as a source of information for a wide variety of purposes.

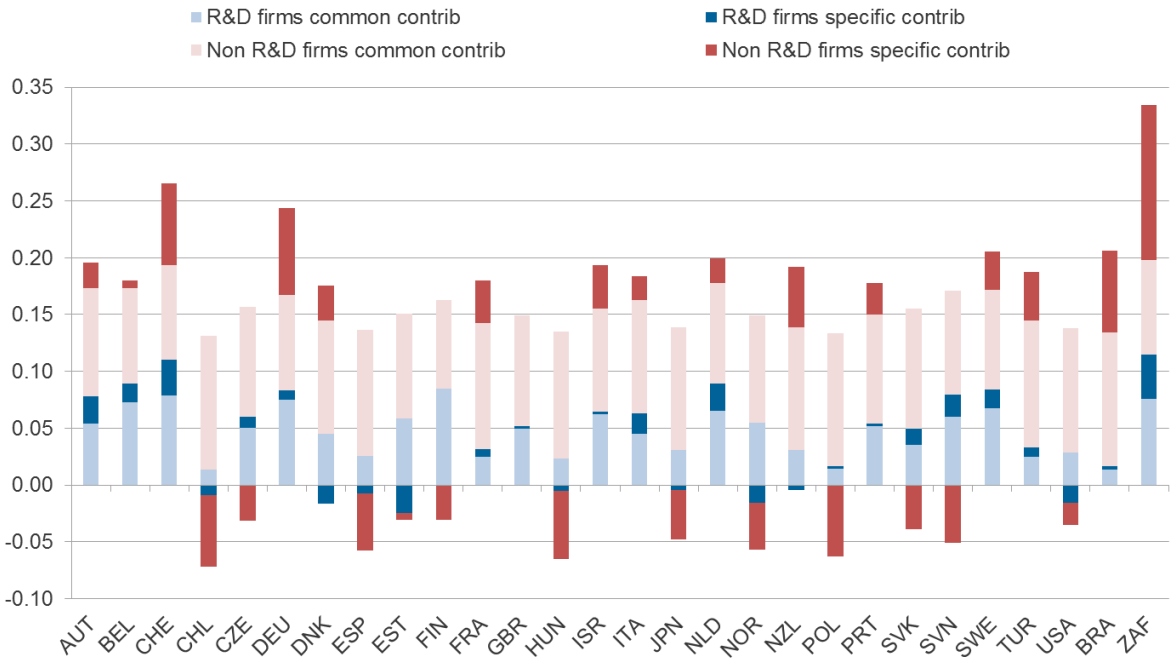
While some differences can be accounted for by differences in sample compositions (e.g. coverage of certain, less knowledge intensive service sectors or the definitions reported, e.g. in South Africa those firms with ongoing or abandoned innovations are considered as innovators), there is considerable variation in the data yet to be satisfactorily explained. An increasing body of evidence has been accumulated to show that companies tend to respond to questions on innovation reacting to various unintended "signals" and implicit incentives built in within surveys used to collect the information. For example, while combining R&D and innovation surveys into a single instrument can deliver some cost and burden reductions, recent studies suggest that companies are more likely – despite guidelines to the opposite – to interpret questions on innovation as solely focused on innovations arising from R&D activities.[12] It has also been found, in the Dutch context, that changing questionnaires to online formats can help increase willingness to report innovations, as a postal/written format can discourage positive responses because of the apparent addition of extensive follow-on questions.

A detailed understanding of the link between R&D and innovation also helps explain some of the observed variation in innovation rates across countries that are often difficult to explain and contrast with more established indicators. For example, **Figure 5** shows that the contributions to product innovation rates of non-R&D firms are significantly higher than those from R&D firms. Furthermore, much of the variation comes from differences across product innovation rates within firms that do not do R&D. Differences are much smaller for firms that do R&D, but even in that case, differences are found that appear to relate to the combination with R&D surveys.

12. See for example Wilhelmsen (2012) which provides quasi-experimental results that are consistent with cross country correlation patterns. He also points out the role of compulsory surveys, which are often associated with much higher response rates and lower "average" rates of innovation, in what suggests that when not compelled to reply, non-innovators are more likely to exclude themselves, thereby biasing results upwards.

Figure 5. Contributions to estimated country shares of product innovating firms

As a proportion of firms, by R&D status and relative to average product innovation rates within each group



Source: OECD analysis, based on Eurostat and national data published in www.oecd.org/sti/inno-stats.htm

It has also been found that firms which have failed to identify themselves as innovators can provide – if prompted – valid innovation examples with a high probability. These often tend to correspond to what are described as non-technological forms of innovation. It has been noted that the rate of false negatives among the firms reporting themselves as non-innovators can be even larger than the rate of false positives among the population of self-reported innovators (Arundel, O'Brien and Torugsa, 2013). However, this does not imply that the true rate of innovation is necessarily higher than reported in official statistics. The overall bias in the final estimates depends on the share of self-reported innovators.

Analysis of innovation survey micro-data can also reveal a great deal about firms' experience and understanding of innovation. The Community Innovation Survey typically contains 12 separate items that can support the construction of basic (e.g. the four core types of innovation) and complex innovation indicators (**Box 3**). In addition to the various types of innovation, the CIS contains two indicators describing whether the firm has ongoing or abandoned innovations, respectively, as well as indicators characterising innovation activities undertaken by the firm, namely whether it is engaged in internal R&D, acquiring external R&D services, external knowledge, activities geared towards the market introduction of new products, training, capital and IT deployment and other activities (which include design). This generates a total of 22 binary indicators, therefore implying – before counting other information collected in the survey on collaborations and sources of information – thousands of different possible modes of innovation, that is, possible combination patterns which can be summed up through visualisation tools (**Figure 6**).

Box 3. Questions in the CIS2012 helping identify which companies introduced an innovation

Product (good or service innovation): A product innovation is the market introduction of a **new** or **significantly** improved **good or service** with respect to its capabilities, user friendliness, components or sub-systems. Product innovations (new or improved) must be new to your enterprise, but they do not need to be new to your market. Product innovations could have been originally developed by your enterprise or by other enterprises. A **good** is usually a tangible object such as a smart phone, furniture, or packaged software, but downloadable software, music and film are also goods. A **service** is usually intangible, such as retailing, insurance, educational courses, air travel, consulting, etc.

During the three years 2010 to 2012, did your company introduce:

- **Goods innovations**: New or significantly improved goods (exclude the simple resale of new goods and changes of a solely aesthetic nature)
- **Service innovations**: New or significantly improved services

Process innovation: A process innovation is the implementation of a **new** or **significantly** improved production process, distribution method, or supporting activity. Process innovations must be new to your enterprise, but they do not need to be new to your market. The innovation could have been originally developed by your enterprise or by other enterprises. Exclude purely organisational innovations – these are covered in section 9.

During the three years 2010 to 2012, did your company introduce:

- New or significantly improved **methods of manufacturing or producing goods or services**
- New or significantly improved **logistics, delivery or distribution methods** for your inputs, goods or services
- New or significantly improved **supporting activities** for your processes, such as maintenance systems or operations for purchasing, accounting, or computing

Organisational innovation: An organisational innovation is a new organisational method in your enterprise's business practices (including knowledge management), workplace organisation or external relations that has not been previously used by your enterprise. It must be the result of strategic decisions taken by management. Exclude mergers or acquisitions, even if for the first time.

During the three years 2010 to 2012, did your company introduce:

- New **business practices** for organising procedures (i.e. supply chain management, business re-engineering, knowledge management, lean production, quality management, etc)
- New methods of **organising work responsibilities and decision making** (i.e. first use of a new system of employee responsibilities, team work, decentralisation, integration or de-integration of departments, education/training systems, etc)
- New methods of **organising external relations** with other firms or public institutions (i.e. first use of alliances, partnerships, outsourcing or sub-contracting, etc)

Marketing innovation: A marketing innovation is the implementation of a new marketing concept or strategy that differs significantly from your enterprise's existing marketing methods and which has not been used before. It requires significant changes in product design or packaging, product placement, product promotion or pricing. Exclude seasonal, regular and other routine changes in marketing methods.

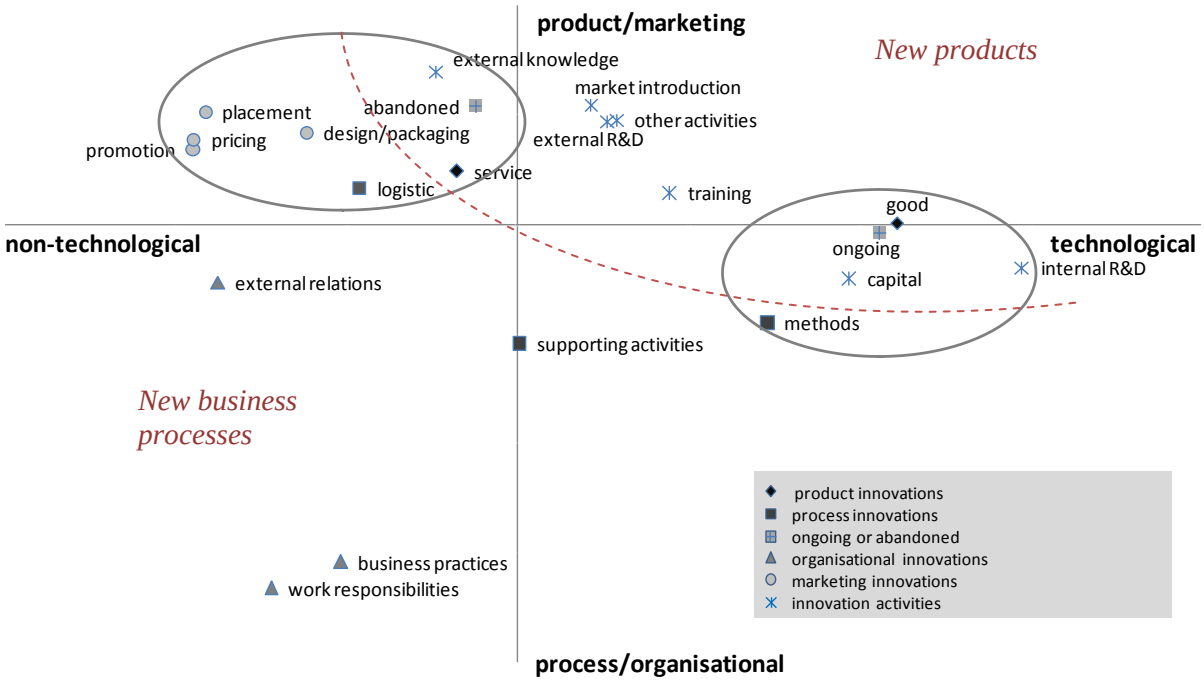
During the three years 2010 to 2012, did your company introduce:

- Significant changes to the aesthetic **design** or **packaging** of a good or service (exclude changes that alter the product's functional or user characteristics – these are product innovations)
- New media or techniques for **product promotion** (i.e. the first time use of a new advertising media, a new brand image, introduction of loyalty cards, etc)
- New methods for **product placement** or sales channels (i.e. first time use of franchising or distribution licenses, direct selling, exclusive retailing, new concepts for product presentation, etc)
- New methods of **pricing** goods or services (i.e. first time use of variable pricing by demand, discount systems, etc)

Source: Eurostat, CIS 2012 Model Questionnaire. Each bullet point represents a specific item recorded as yes/no.

Figure 6. Two-dimensional mapping of innovation types and activities, 2006-2008

Representation based on multidimensional scaling of co-occurrence matrix



Source: OECD calculations (INNOSERV project) based on CIS 2008 microdata (Eurostat), 2012.

Notes: Unweighted multi-dimensional scale 2D representation of innovation survey results for the combined micro-data for tens of thousands of firms from CZE, DEU, ESP, EST, FIN, FRA, HUN, IRL, ITA, LUX, NLD, NOR, PRT, SVK, SVN and SWE. Axes are *tentatively* named on the basis of the variables more strongly associated to 2D representation. The dotted line represents an implicit frontier between product and business process oriented innovations.

The clustering of goods innovations with internal R&D activities, the introduction of new production methods (a type of process innovation) and acquisition of capital and IT indicates the existence of what could be described as a generic type of "technological" or R&D intensive innovation. This appears to indicate that this is a primary aspect of the distinction among firms in their approach to innovation.

A majority of process and organisational innovations are located in the lower part of the chart, while a majority of product and marketing-related innovations lie at the top. This appears to indicate a second dimension that separates product-focused innovation from general process-oriented innovation.

There is significant heterogeneity for the components within the four core innovation types proposed in the *Oslo Manual*:

- Within the two types of product innovations, service innovation is more strongly related to non-technological and market oriented activities, while goods innovations, as earlier noted, is often found to co-occur with R&D, capital and the introduction of new production methods. The item on the introduction of new production methods, while formulated with reference to goods and services, appears to be interpreted by respondents mostly in relation to goods.
- Within process innovations, the introduction of logistic and delivery methods is more closely associated with services and marketing innovations, in contrast to the case of production and delivery methods, while supporting activities are relatively equidistant with most other forms of innovation, probably reflecting the general wording of the question.

- In the case of marketing innovations, most of them cluster around each other in a defined region in the chart (product oriented, non-technological).
- As for organisational innovations, the introduction of business practices and adoption of new methods for allocating work responsibilities occupy an identical, extreme positioning in the 2D mapping, while organisational innovations relating to the adoption of new external relations are much more closely related to marketing innovations and process innovations related to logistics.
- Innovation activities – only defined for product and process innovative firms – span along the clusters defined by the different types of innovation that concern new products and process, from R&D and capital investments (closer to new goods and production process) through to market introduction activities (which include design), external R&D, external knowledge, other innovation activities (closer to marketing and service innovations), and training.

In conclusion, the "correlation" patterns for different types of innovation and innovation activities point to potential inconsistencies between the definitions and the results of their implementation, also raising questions about how design can be positioned.

3.2. Are subjective questions a fundamental problem of the Oslo Manual?

The importance of validation methods for the measurement of innovation activities is apparent. Innovation is often considered to be a "fuzzy" concept and experience shows that it can be very context and culture-dependent. The measurement of innovation entails a relatively long journey from the theoretical world of concepts and constructs (*e.g.* Schumpeterian notions of innovation) through to the empirical world in which they need to be operationalised and implemented into data collection instruments.

Business enterprise surveys do by and large attempt to collect quantitative data based on well-established concepts with limited scope for reinterpretation, for which reporting biases are more or less well understood. Innovation surveys are mainly of a qualitative nature and subject to varied interpretation. It remains a challenge what are the drivers behind different perceptions and judgements about what is an innovation. Although there are several established enquiries that deal with subjective concepts[13] and the widespread mainstreaming of the innovation construct, there continues to be a widespread reluctance to accept and promote the use of innovation survey results for this particular reason.

Innovation surveys currently occupy an intermediate territory between more traditional business statistics and in-depth qualitative enquiries which cannot aim, for very clear costs reasons, to statistically describe an entire population. Smith (2005) notes for example that it is very unclear whether CIS, or indeed any other survey-based method, can grasp the dimensions of innovation so the question arises as to what can be done with survey questionnaires and what cannot. He notes that survey instruments may not be appropriate research tools for exploring some dimensions of innovation such as problem solving, noting the longstanding tension between statistical methods, with their advantages of generality but lack of depth, versus case study methods, which offer richness at the expense of generalizability.

13. For example, unemployment statistics are based on the aggregation of subjective assessments of individuals as to whether they are not in paid employment or self-employment during the reference period; currently available for work, that and actively seeking work, that is, had taken specific steps in a specified recent period to seek paid employment or self-employment. Surveys contain guidance as to what that means, referring as examples registration at a public or private employment exchange; application to employers; checking at worksites, farms, factory gates, market or other assembly places; placing or answering newspaper advertisements; seeking assistance of friends or relatives; seeking resources or permits and licences to establish own enterprise. [Source: ILO (1982), para. 10; retrieved from OECD Glossary of Statistical Terms]. The OECD has also recently released formal guidelines on measuring subjective wellbeing OECD(2013b).

A number of statistical and social research tools can be used to assess and eventually improve the process by which concepts and attributes are operationalised into questions. Cognitive interviews for example provide a mechanism for testing concepts, definitions, questions and questionnaires before rolling them out to the population. NESTI has carried out an in-depth qualitative study to assess business views of what is innovation and how relevant and well understood are the concepts and definitions proposed in the *Oslo Manual*. Evidence from a first round of testing of general and Oslo innovation concepts with more than 50 companies predominantly in Europe and the United States indicated:

- Wide acceptance of the removal of technological tags for innovations. However, when prompted for examples, most firms point out technology-related innovations, often related to ICT. This may well be because of the highly pervasive nature of ICT in any changes introduced by firms.
- Product and process innovations are the most common, unprompted innovation concepts cited by firms, who recognise and accept the Oslo definitions. Marketing innovations are not widely accepted and firms systematically struggle to differentiate between process and organisational innovation.
- Firms generally accept the notion that innovations do not have to be met by success in the marketplace and note the value of abandoning projects and the experience and evidence gathered in the process. However, there appear to be some differences between European and US-based firms, with the latter tending to adopt a narrower view of innovation more closely tied to the notion of success and novelty to the market. Novelty to the firm only is rarely accepted as an innovation by participants in cognitive testing exercises.

Cultural differences can play a role in shaping inter- and intra-national comparisons of innovation behaviour in firms. For example, the English terms of innovation and design have been adopted literally in many other cultures where the traditional concept related more closely to notions of invention and technological innovation. This has been investigated by experts at the National Institute of Science and Technology in Japan (Yonetani, 2012), looking at comparing responses from individuals in the United States, Germany and Japan who were presented with situations – vignettes – describing changes in firms and asking them to rate them as innovations using the *Oslo Manual* definitions. Based on nearly 3,000 responses from a panel, individuals surveyed by a market research company, the preliminary results indicate a considerable degree of national differences in the appreciation of what is meant by innovation, with highest reluctance to define a given vignette as an innovation found for Japan, followed by Germany, relative to the United States.

The vignette technique could be used more systematically to measure the coherence between the subjective answers provided by firms and the answer to a standard, objective question according to the *Oslo Manual*. An implied measure of the degree of perception of innovation by the company could be used as part of the quality assessment implemented by statistical offices, and might be eventually used to adjust responses to render them comparable within a given population. From the perspective of supporting international comparisons of innovation, this is a potentially appealing approach to account for cultural and related differences in influence. However, given the current state of the evidence available, it is not possible at this point to recommend using methods to "correct" mean average country-level innovation data. Without additional external validation analyses, it is not yet clear, for example, whether any adjustment actually adds to the validity of the data or to its usefulness in terms of predicting future behaviour and other economic outcomes. Correcting data for all country-specific influences on how objective innovation activities are perceived would likely risk removing the influence that other unmeasured country differences (including the influence of a country's innovation and economic policy and a wide range of valid cultural differences) have on how subjective assessments and responses are formed.

Given the sensitivity of indicators to survey design and cultural factors, it remains an open question to what extent increased comparability can be achieved by means of greater uniformity in implementation. The current model for delivering innovation survey results is hardly a centralised one. Future developments will depend on the extent to which international comparability is prioritised versus other desirable features such as the importance of catering for specific national interest and dealing with resource and administrative constraints.

3.2. Improving the quantitative questions in innovation surveys

As part of an OECD/NESTI collection on innovation survey metadata carried out in 2012, NESTI delegates were asked to report on their perception of which questions companies find more difficult to address – for example as measured by high item non-response. The purpose of this question was to help inform the priorities for the NESTI work on cognitive testing of innovation survey concepts, definitions and questions. Most countries identified the question on innovation expenditures as the most difficult to address, largely followed by reporting data on turnover from new products.

Cognitive interviews carried out in the framework of the NESTI activity to review how business view innovation and react to Oslo definitions also included an investigation of what records companies have (lack) which can enable them to provide (prevent from providing) information on their innovation expenditures and outcomes. The interviews carried out in Europe and the United States showed that several categories of innovation expenditures (software, equipment, R&D, design, IP rights, licenses, training, collaborations, alliances, etc.) were considered relevant by respondents, but it would be difficult to differentiate the activities related to innovation from the regular ones. Data collected on this item would be at best incomplete. Information on employees' certifications and skills is generally not tracked by firms in the sample of US-based firms, but several firms in the European sample reported having such records. Most common expenses for both samples were related to additions of software, property, plant and equipment, in particular software related to IT. The second most relevant expenditure for both samples was related to design activities and advertising and market research. On the other hand, respondents from both samples found the idea of design vague and asked for clarification.

The review of country responses and cognitive testing reports that have been made available points towards a number of topics which have proved more difficult to capture through questions, and highlight the (sometimes difficult) compromises and different solutions that have been made to elicit meaningful answers for questions on different concepts of interest. There has been a significant divergence of approaches for questions on innovation expenditures, reflecting both their own testing experiences but also their own interpretation of testing results (see **Table 2**). In some contexts, even when a question has proved problematic, there have been broader imperatives taken into account that have led to questions being finally adopted and implemented.[14] Overall, reducing high item non-response rates became the prime objective (Arundel and Bordoy, 2005), minimising the need for the respondent to retrieve the responses to a question (e.g. sales or R&D expenditures) from records, with potential loss of accuracy.

14. Arundel and Smith (2013) reflect on the changes that have been undergone by the innovation expenditure questions in different waves of the CIS. Having considered asking only for qualitative data on innovation activities, a quantitative question was retained because of strong policy interest. Definitions of innovation activities were included, with qualitative information (yes/no questions) collected in the first stage, focusing on a reduced set of main activities when asking for actual expenditure data in a second stage. This has likely contributed to increasing the item response rate for this question, e.g. from 64% in CIS1 to 85% in CIS4. CIS questions on expenditures after the *Oslo Manual* revision in 2005 continued to relate specifically to product and process innovations for a majority of countries that followed the CIS model questionnaire. Previously, cognitive interviews with firm managers had found that a large percentage were unable to provide answers to the proposed expenditure questions on organisational innovations.

Table 2. Innovation expenditure and design questions in innovation surveys, selected countries

Country & year	Question	Population	Breakdowns and notes	Requested value
AUS, 2011	• What was the expenditure of this business during the year ended 30 June 2011 on the development and introduction of all new goods, services, processes or methods?	Firms with innovation activities across all types, in reference year	*Note: For the purposes of this survey, estimates of expenditure are acceptable. You do not need to seek exact figures from your accountant.*	5 choices representing intervals, or exact number above AUSD 5 million.
CAN, 2009 (and 2012)	• In 2009, what was your enterprise's total **expenditure on your process innovations**? • In 2009, what was your enterprise's total **expenditure on your good or service innovations**? • For 2009, please estimate your enterprise's total marketing expenditures.	Firms with process or product innovations. Marketing innovators.	Separate questions for each type. No org. Mkt question not about innovation expenditures	Amount.
EUR-CIS, 2012	• How much did your enterprise spend on each of the following innovation activities in 2012 only? Innovation activities are defined in question 5.1 above. *Include current expenditures (including labour costs, contracted-out activities, and other related costs) as well as capital expenditures on buildings and equipment.*	Firms with product and process innovation activities	In-house R&D; external R&D; acquisition of equipment; acquisition of external knowledge; all other innovation activities **including design**, training, marketing.	*Amounts. Please fill in '0' if your enterprise had no exp. for an activity in 2012. With a lack of precise accounting data please use estimates*
GBR, 2012	• For each of the main innovation related investments in question 4, please ESTIMATE the amount of expenditure for the year 2010. Include both internal costs and purchases from outside the business.	Firms with activities under all four types of innovations	Other category in CIS expanded: Training for innovative activities **All forms of design** (excl R&D); Other market introd of innovations	*Amount*
CHN 2006	• Innovation expenditure in 2006 on: • Expenditure on protection and utilisation of patents in year enterprise in 2006. • The expenditure on purchase of foreign technology in 2006 was …? • [Likewise for domestic]	Product and process innovators with innov. activities in 2004-06	As for CIS. Added questions on patent protection and technology purchase expenditures	Amount.
KOR, 2008	• Please estimate the expenditure used in the 3 year period 2005-7 for the innovation activities.	Manuf. firms, product, process, organisat. & marketing innovative firms.	Split into R&D and non R&D activities, including other preparations and training.	Values for R&D intra and extra and non-R&D activities.
MEX, 2009	• Resources devoted to innovation activities. Indicate expenditures on the following innovation activities in 2009: [*Acquisition of machinery; other tech acquisition; training for innovation; launch and marketing of tech innovations;* ***industrial design;*** *software; preparations for services and delivery methods]*	Enterprises with technological innovation activities	**8 detailed categories** Also current and capital expenditures.	Amount.
NZL, 2011	• For the last financial year, please estimate this business's combined expenditure on product development and related activities:	All firms	R&D; **design**; marketing and market research.	Amount.

Source: OECD, based on questionnaires provided by countries and organisations.

4. Testing a "ladder" model of design - how does design relate to innovation and economic performance?

4.1. The ladder model

Within the design world, a number of concepts have achieved considerable popularity. However, only a few have been implemented in statistical surveys. Ladder models of design use posit that there is a possible range of roles of design that are ordered from no design use to more integrated and sophisticated uses in the firm.[15] An implementation of the ladder model of design was tested by Statistics Denmark as part of its R&D and innovation survey for 2010 and more recently in 2012.

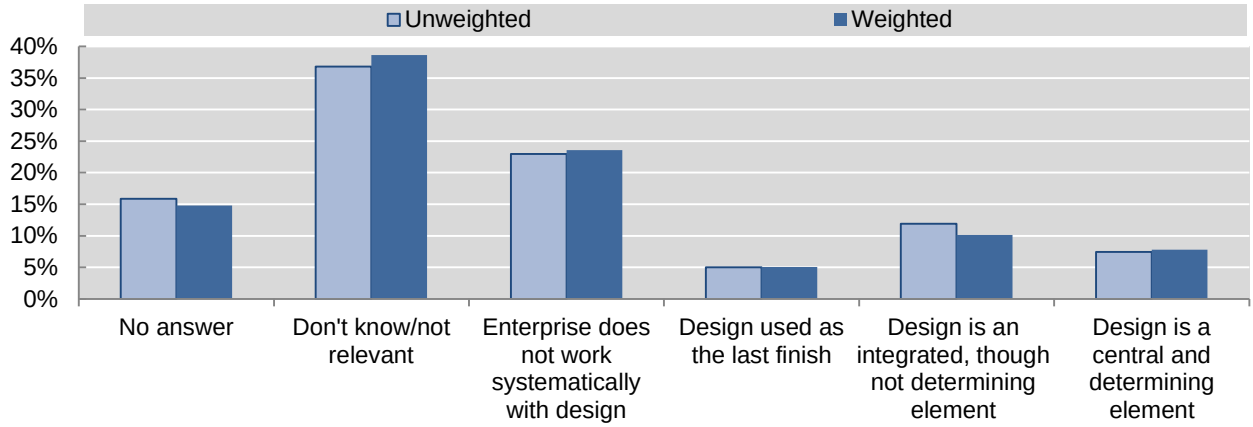
Table 3. Ladder models of design use in firms

Level	DME staircase model	Danish Design Centre	Denmark's CIS survey 2010
1	**No design management:** Businesses make no use of Design Management and design outputs are unpredictable. Design has no role in the business objectives and is only applied occasionally with no or limited objectives.	**No Design** Design plays little or no role in product or service development. For instance, product and service development is performed by personnel who are not design professionals. The utility of the end-user tends not to be considered.	Not known, not applicable The enterprise does not work systematically with design
2	**Design management as a project** The use of design is very limited to meeting direct business needs and it is restricted to adding value to existing products through styling, packaging etc. and is only used as a marketing tool with minimal coordination. Responsibility of design remains at operational level.	**Design as Styling** Design is only relevant in terms of aesthetic considerations such as style, appearance and ergonomics. Sometimes professional designer may be involved but styling will be predominantly purchased internally or from professionals in other sectors.	Design is used as last finish, when developing new products etc.
3	**Design management as a function** Design is integrated in the New Product Development process and several disciplines and specialists become involved in the design process. The formal responsibility for design lies with an assigned staff member or department managing all involved groups.	**Design as a Process** Design is considered in terms of a process or method in product or service output but is only employed at the initial stages of development. The design solution is procured externally and is adapted to the requirements of the end-user using a multidisciplinary approach.	Design is an integrated, though not directing element of the development work of the enterprise
4	**Design management as a culture** Design is an essential part of their differentiation strategy, generating a distinct competitive advantage. Design is an integral part of the business processes with involvement of a range of departments. A design literate top management is reinforcing the support and significant value of design amongst the entire business. This results in design being a part of the businesses' corporate culture.	**Design as Strategy** Design is integral to a company's continuous renewal of their business concept as a means of encouraging innovation. The design process is fused with the company's key objectives and plays a role at every stage of development	Design is a central and directing element in the foundation of the enterprise
Source	http://www.dmeaward.com/the-staircase-model/ and Kootstra (2009).	Danish Design Centre www.ddc.dk	Denmark R&D and Innovation Survey 2010

15. This ordered perspective, implying that higher degrees of integration deliver higher benefits to firms independently of their conditions, has been significantly questioned as not broadly relevant and its use for prescriptive purposes somewhat criticised.

Respondents were able and willing, by and large, to answer this voluntary question with very low non response rates. The micro-data from the 2010 survey were analysed by Statistics Denmark using a SAS code provided by the OECD secretariat intended to identify the role of design, as captured by the questions asked, as related to business characteristics and economic outcomes and controlling for a range of factors. This analysis thus provides a valuable quantitative case study on which to test the validity of design questions. A minority of enterprises (**Figure 7**) report using design, either as the last finish (5% of the Innovation Survey respondents), as an integrated though not determining element (12%) or as a central and determining element (7%).

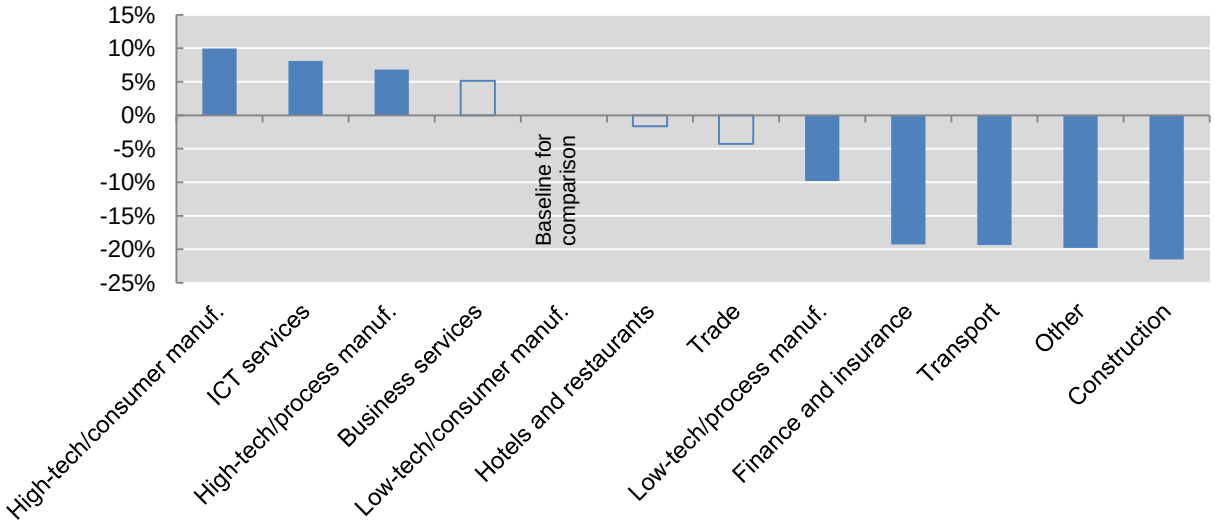
Figure 7. Distribution of answers to the question on the level of design engagement, 2010



Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.
Note: Basis = Population of 4 306 enterprises responding to the Danish Innovation Survey 2010.

Differences in the use of design by sector indicate a clear relationship with technology intensity and with consumer focus (**Figure 8**).

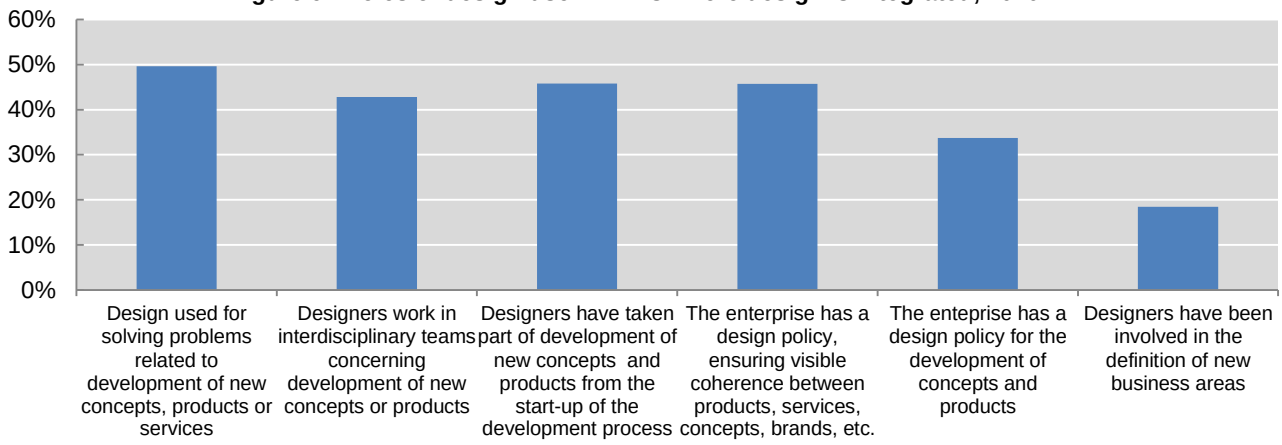
Figure 8. Differences in the probability of using design as an integrated element, by sector, 2010



Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.
Note: Marginal sector effect on the probability of using design as an integrated element, obtained from a probit model estimation, controlling for size. Baseline=Low-tech/consumer manufacturing. Translucent bars correspond to non-significant differences with the baseline at 10% level.

Design is a relatively broad concept and its use can reflect different purposes and methods. The role of design activities in business varies across and within sectors. For firms reporting to use design as an integrated element (determining or not), the Danish CIS 2010 further enquires about the roles of the design activities conducted. Only a minority (18%) of firms reporting to integrate design indicate that designers are involved in the definition of new business areas, while less than 40% of them consider design as a central and determining element (**Figure 9**). This may reflect a tendency to overstate the degree of design integration. A small proportion of firms reporting to use design as an integrated element did not match any of the proposed examples (15%). If this were the case, the analytical results presented below would tend to overstate the "impact" of design.

Figure 9. Roles of design use in firms where design is integrated, 2010



Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.

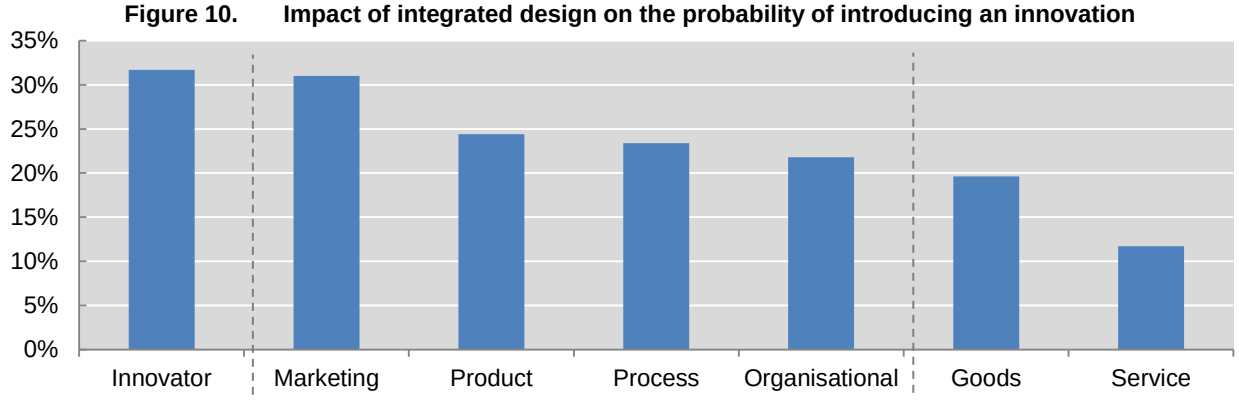
4.2. Design activities and innovation

Even after controlling for other firm characteristics (size and sector), firms reporting to use design as an integrated element are found to be significantly more likely to introduce all of the standard types of innovation (**Figure 10**). This relationship is strongest for marketing innovations[16], with a marginal effect of design use on the probability of introducing this type of innovation of 31%, followed by product innovations (with a marginal effect of 24%). The marginal effect on the probability to introduce process and organisational innovations is also not negligible, reaching 23% and 22%, respectively.

It is also worth noting that although item response rates on design are low and fairly independent of firm size and sector, firms that choose not to respond to the question tend to have significantly lower average innovation rates. This is indicative of some degree of sample selection. This would slightly bias the results by overstating the estimate of design propensity but understating the estimated impact of design on innovation.

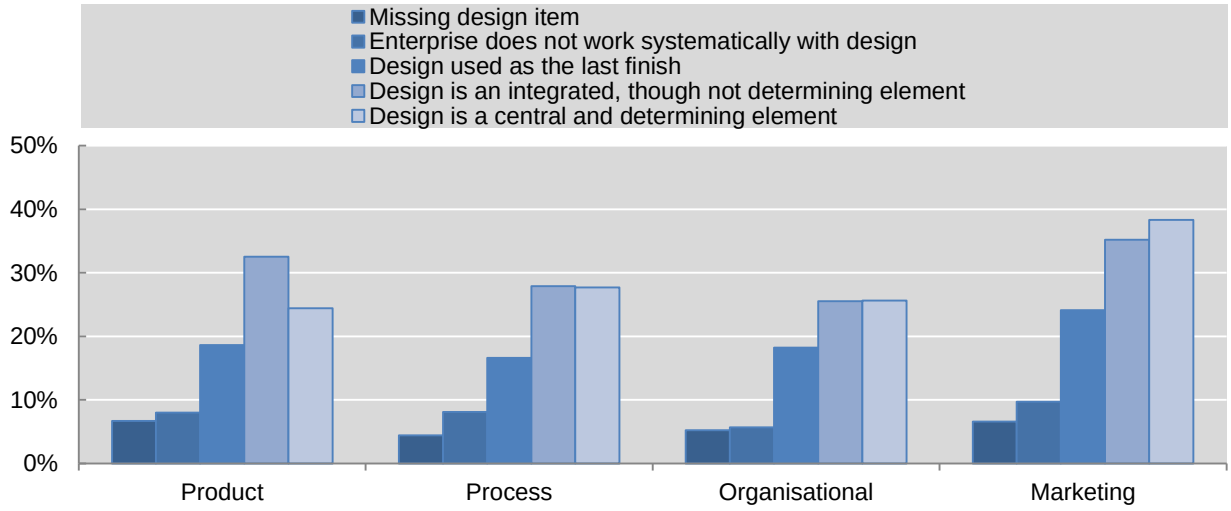
16. This partly reflects the conceptual proximity between design activities and certain types of marketing innovation, such as aesthetic design and packaging, which involve almost by definition the work of designers.

Figure 10. Impact of integrated design on the probability of introducing an innovation



Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.
Note: Marginal effects obtained from probit model estimations, controlling for size and sector. 'Innovator' refers to firms with product, process, organisational or marketing innovation. All coefficients are significant at 1% level.

Figure 11. Impact of levels of design use on the probability of introducing an innovation, 2010



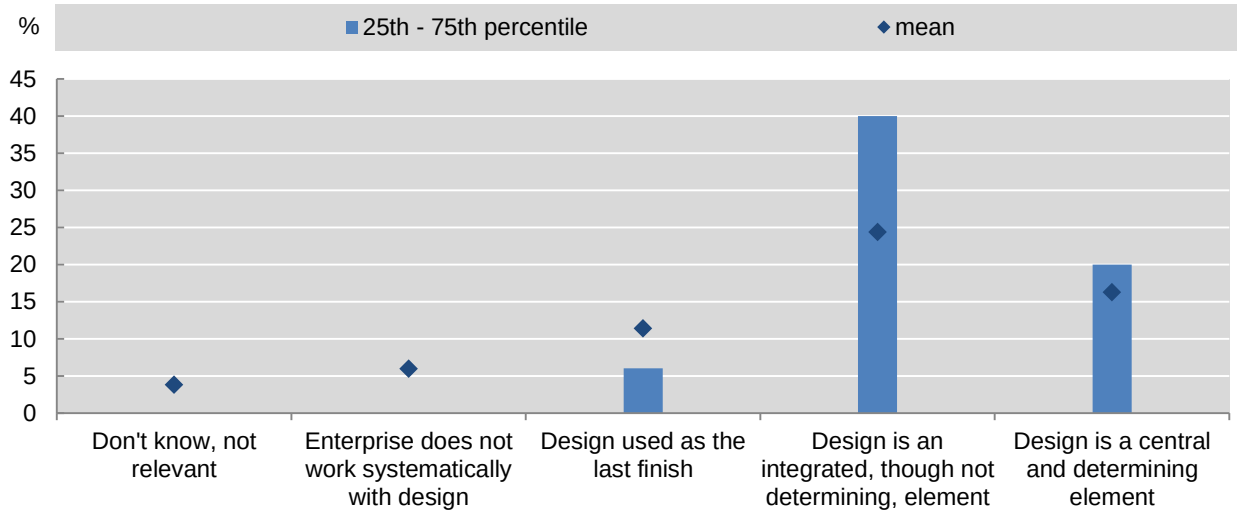
Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.
Note: Marginal effects obtained from probit model estimations, controlling for size and sector. Baseline="don't know/not relevant". All coefficients are significant at 5% level.

Design tends to be positively related to innovation across all sectors of activity. In all sectors and for all types of innovation the proportion of firms innovating is significantly higher among firms using design as an integrated element than among other firms. The relationship between innovation and design also differs according to the size of the firm. The gap between innovating rates of firms using design as an integrated element and other firms tends to decrease with firm size for all types of innovation except for product innovation. Overall, increasingly integrated levels of design engagement tend to be associated with a higher probability of innovating, although this is not systematically the case at the upper end of the design ladder (**Figure 11**). Process and organisational innovation rates are fairly similar for the "design non-determining" and "design determining" firms while product innovation rates are actually lower for the latter (although still above those firms that only use design as last finish).

This pattern is also reflected in the relationship between design and the share of turnover accounted for by new or significantly improved products (**Figure 12**). Among firms where design is a central and determining element, both the average (16%) and the 75th percentile (20%) of the proportion of innovative turnover are lower than among firms where design is an integrated though not central element

(24% and 40%, respectively). Using design as an integrated element is found to be positively and significantly correlated to higher shares of innovative turnover. Within the group of product innovating firms, those with integrated design have on average a 9 point (standard error=2%) higher share of turnover from new or improved products than their counterparts without integrated design, even after controlling for sector affiliation and firm size. In the overall population of firms the difference is 4.2% (standard error=0.8%). A positive relationship between innovative turnover and design scores is also found among the sample of firms with integrated design.

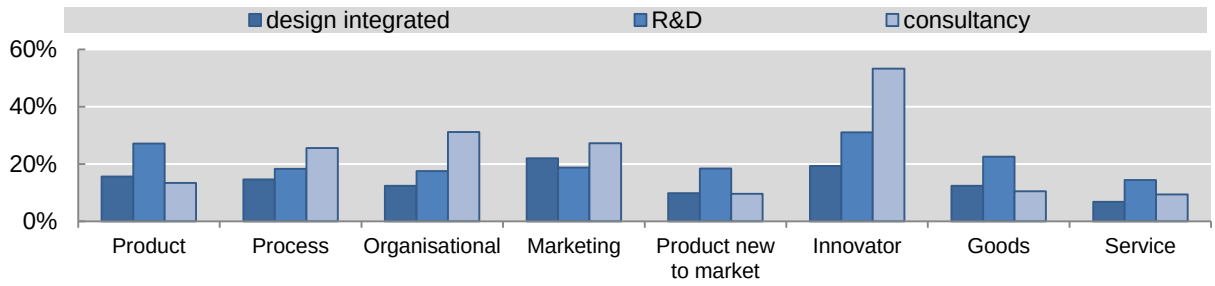
Figure 12. Share of turnover from new or improved products, by level of design engagement, 2010



Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.
Note: Based on population of enterprises responding to the questions on design.

Firms using design also conduct a range of innovation activities. More than 30% of firms with design integrated have intramural R&D activity and around 25% purchase consultancy for innovation. Firms using design as an integrated though not central element tend to conduct internal R&D activities more frequently than firms for which design is a central element, whereas the latter tend to conduct external R&D activities more frequently, especially purchasing consultancy for innovation. This is also consistent with evidence that firms where design is determining tend to collaborate frequently with other partners to develop their innovations. Controlling for R&D and consultancy, it is possible to note that the association between design and innovation is a robust and significant one (**Figure 13**). The relative effect of design use compared to R&D appears to be higher in knowledge intensive service sectors than in others.

Figure 13. Impact of design, R&D and consultancy activities on the probability of innovating, 2010



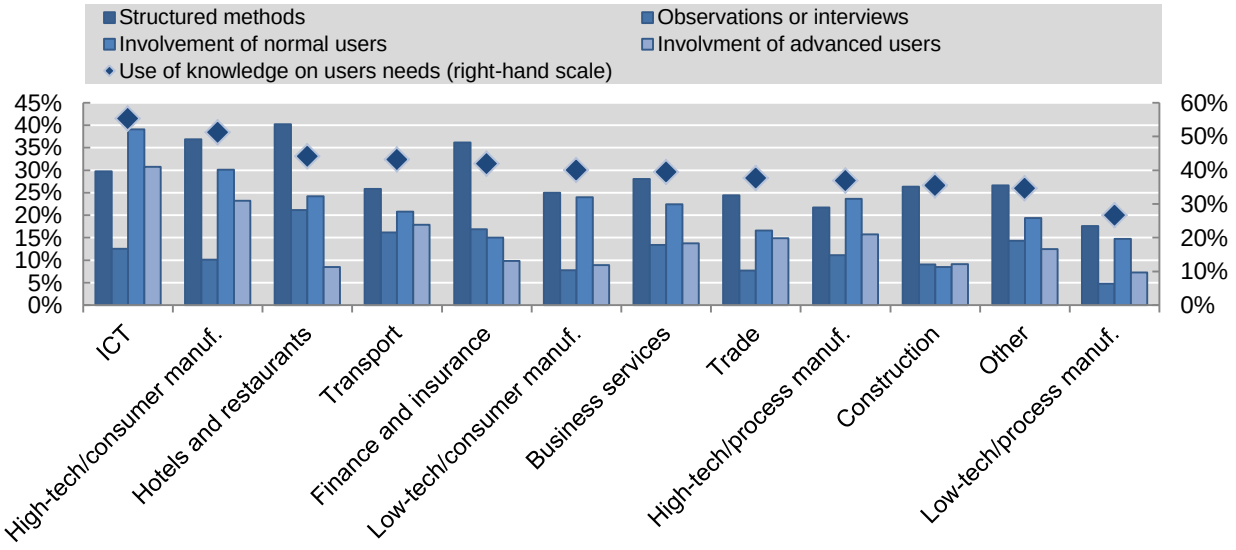
Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.
Note: Marginal effects obtained from Probit model estimations with the different types of innovation as dependent variables and the different activities as explanatory variables, controlling for size and sector. All coefficients are significant at 1% level.

4.3. Design and customers

One key element of the design process is its user centred approach. It is therefore possible to hypothesise that companies with integrated design will be more likely to make use of a range of methods intended to secure information and knowledge from customers. Firms that have introduced an innovation or have ongoing or abandoned activities have been asked about the use of knowledge on customer/user needs, including which types of knowledge on customer/user needs were used in concept development or implementation of innovation activities. This encompasses items such as knowledge of regular customer contact, structured methods (e.g. market analysis, focus groups), the use of observation or interviews, involvement of regular users (e.g. prototype tests or internet communities) or involvement of advanced users (e.g. lead user methods).

Firms in ICT services (55% of innovative firms) are the most likely to use knowledge on users/customers' needs, followed by those in high-tech manufacturing sectors with an *a priori* focus on consumer products (51%). Firms in low-tech manufacturing sectors with a focus on process, by contrast, use this type of knowledge less frequently (only 27% of innovative firms). The types of methods used in order to get knowledge on customers/users needs tend to differ across sectors. Whereas in most sectors the most frequently method used by innovative firms consists in structured methods such as market analyses or focus groups, in ICT services as well as in process oriented manufacturing sectors, the most frequently used method is the involvement of normal users (**Figure 14**).

Figure 14. Share of innovative firms using knowledge on customers / users' needs in innovation activities, by sector, 2010



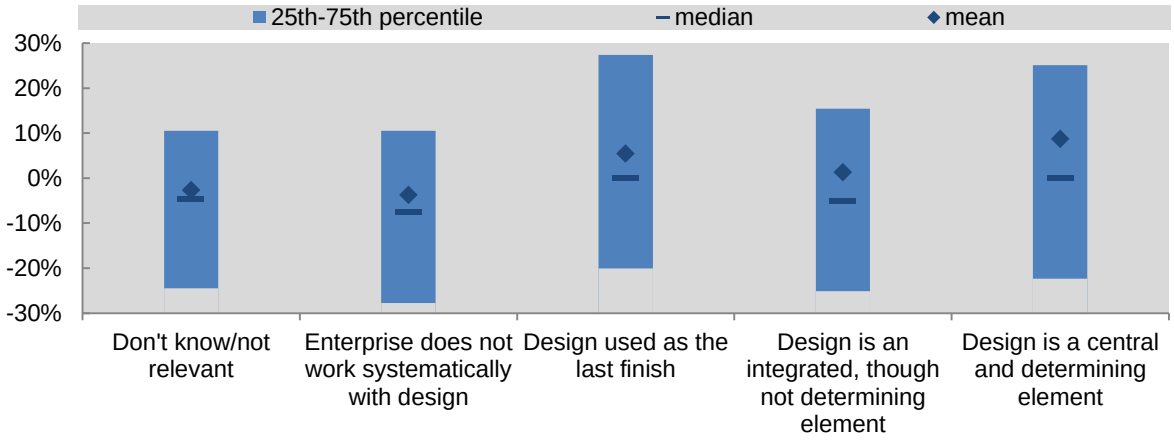
Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.
Note: Basis = Population of innovative enterprises responding to the questions on design.

1. When controlling for other firms characteristics (size and sector), design use is found to be positively and significantly related to all types of methods for obtaining knowledge on user/customer needs. The effect remains significant when controlling for the use of R&D activities. Overall, firms using knowledge on user/customer needs are 17% more likely to use design as an integrated element than other firms, and 12% less likely not to use design at all. The comparison concerning relatively similar firms (innovative firms, controlling for size, sector, and the fact that the firm conducts R&D activities), this result corroborates the initial hypothesis that the two types of activities are closely related.

4.4. Design and economic performance

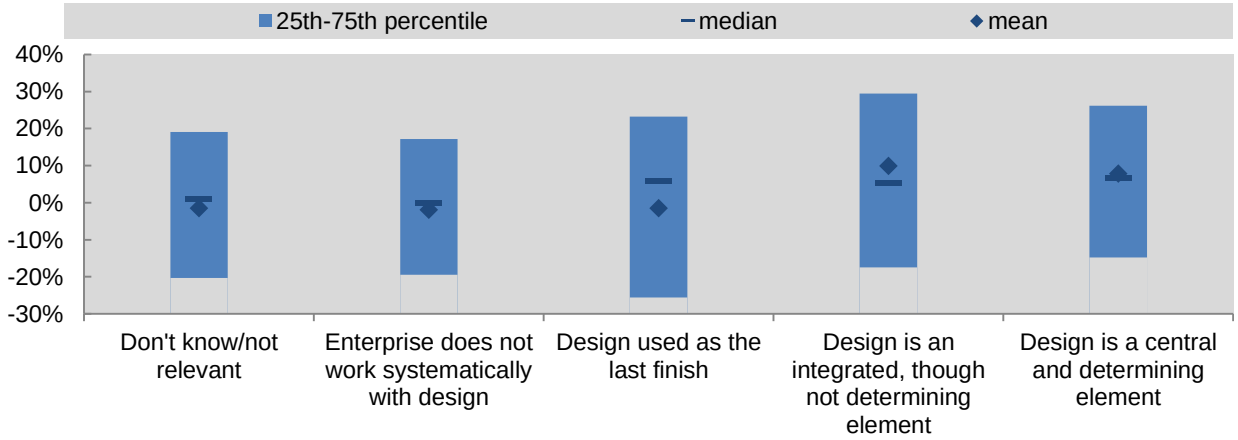
In the Danish CIS sample, firms using design appear to be somewhat more resilient on average in terms of employment changes over the 2008-10 period (**Figure 15**). Firms using design also tend to exhibit higher rates of productivity growth, with median growth rates at 6.0% for firms using design as a "last finish", 6.6 % for firms using design as a central element and 5.2% for firms using design as an integrated though not central element, whereas median productivity growth was nil for firms not using design (**Figure 16**).

Figure 15. Distribution of firms' employment growth by level of design engagement, 2008-10



Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.

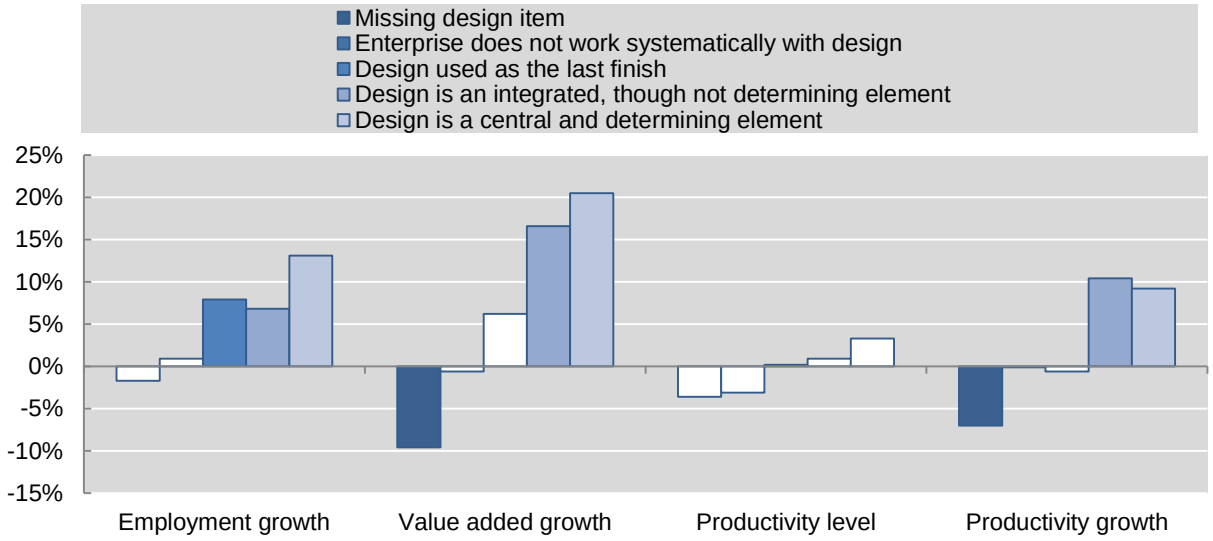
Figure 16. Distribution of firms' productivity growth, by level of design engagement, 2008-10



Source: OECD and Statistics Denmark, based on CIS2010 results for Denmark.
Note: Figures reflect changes in the log of gross value added minus change in log of number of employees in 2008-10.

Controlling for size and sector, firms using design as an integrated element tend to have on average a statistically significant 9.1% higher employment growth rate, a 18.7% higher value added growth rate and 10.4% productivity growth rate than their "non-integrated design" counterparts. Evidence of ladder effects appear to be confirmed according to regression results reported in **Figure 17**.

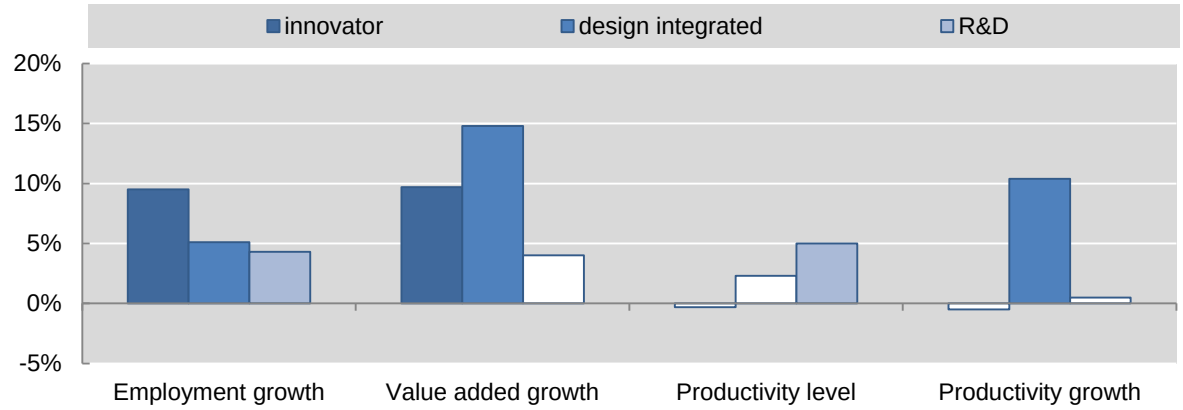
Figure 17. Differences in measures of economic performance according to the level of design use, 2008-10



Source: OECD and Statistics Denmark, based on CIS2010 micro-data for Denmark.
Note: Productivity is defined as the ratio of gross value added to employment. All figures are in logs. Productivity level refers to 2010, while growth variables refer to changes between 2008 and 2010. OLS estimates, controlling for size and sector. Baseline="don't know/not relevant". White bars correspond to coefficients not significant at 10% level. Sample size varies across the various performance variables considered.

These results are very robust to the addition of extra controls that account for the existence of R&D activity within the company and even the reporting of innovation outcomes. It is interesting to note that in the complete specification to describe the productivity growth performance of Danish firms, only the coefficient on design use remains statistically significant (**Figure 18**).

Figure 18. Differences in measures of economic performance according to design use, R&D use and innovation, 2008-10



Source: OECD and Statistics Denmark, based on CIS2010 micro-data for Denmark.
Note: OLS estimates, controlling for size and sector. "Innovator" refers to firms with product, process, organisational or marketing innovation. White bars correspond to coefficients not significant at 10% level. Sample size varies across the various performance variables considered.

Finally, when conducting the same analysis across different categories of sectors, it appears that when controlling for R&D use and different types of innovation, the effect of design use on employment growth is only significant in knowledge-intensive service (KIS) sectors and its effect on value added

growth is only significant in KIS and high-tech manufacturing. The effect of design use on productivity growth is significant in all sectors except among less knowledge-intensive services.

The strength of these results is quite remarkable, but it is important to interpret these strong findings with some degree of caution. The results cannot be thought of as reflecting causal effects from design to performance, but they do convey some important information for decision makers. Moreover, the results do not provide a comparison of the private return to investing in design as opposed to investing in R&D. Indeed, we do not have measures of expenditures on each of these activities, let alone of the implied capital stock associated to each one of those that would be required to estimate rates of return. Furthermore, the identification is based on changes in performance over three years in relation to the reported design/R&D/innovation activity by firms over that period. While demand and structural conditions are partially controlled for by comparing firms within sectors and firm size classes, the fact that the incidence of R&D in firms is well known to be rather stable over time implies that there is limited variation to exploit to identify impacts through short term changes. Therefore, these results should *not* be read as implying that design has a higher impact on productivity growth than R&D, but as an indication of the very robust positive relationship between use of design and the economic performance of firms, at least in the case of Denmark.

Among the potential avenues for future work on this quantitative case study, the analysis could be extended to the results of the 2012 survey in order to test the consistency of the present results and to examine changes over time through a panel analysis. Descriptive indicators produced by Statistics Denmark suggest very stable aggregate results between 2010 and 2012. These survey micro data could be further linked with IPR related variables collected in CIS 2012 and other administrative data on design and other IP rights to support additional analysis on the relationship between design and forms of IP protection.

Overall, the results confirm some of the hypotheses on the role of design, the explanatory validity of the indicators, even if a formal definition of design is not entirely explicit in this framework.[17] It remains to be tested to what extent this approach for measuring design can work in other contexts and whether the analytical results would be similar to those reported here.

17. Design is described in the survey as "solution- and product-oriented work and strategic development in relation to design, styling and finish of products, e.g. industrial-, graphical-, digital-, web-, interior-, fashion and textile design. It may concern concepts, services, strategies, organisations or interactions."

5. Deriving measurement concepts for design

5.1. Rationale for measurement – formulating user interests and needs

Any measurement activity must serve a purpose, for it requires considerable resources and some degree of focus. It is thus necessary to identify who the most likely users are, what they are interested in and how they might use the information. Discussions held at workshops organised by the OECD and the European Commission indicate that there are different categories of potential users of design measurement: academics, policy-makers, businesses, design practitioners and potential design users, all of them having a different purpose for indicators and related evidence. Some participants at the expert workshop held at the OECD in February 2013 highlighted the importance of clarifying those objectives to ensure that the measurement solutions address those needs. Some participants also noted that a formal definition of design may not be necessary, it being more important to acknowledge what is and what is not measured by the tools adopted in different contexts.

One purpose of design measurement is to develop instruments that help determine what is the role and added value of design-driven innovation. For that purpose, users require reliable and comparable evidence on the economic impact of design, to support fact-based policy-development. The European Commission for example has specific interest in this particular dimension, with the aim to draw a comprehensive picture across European countries. A number of European countries have similar perspectives reflected in various policy strategy documents, but it is not completely clear at present whether this is a widespread policy priority across the entire OECD area and whether measurement plays a role in it.

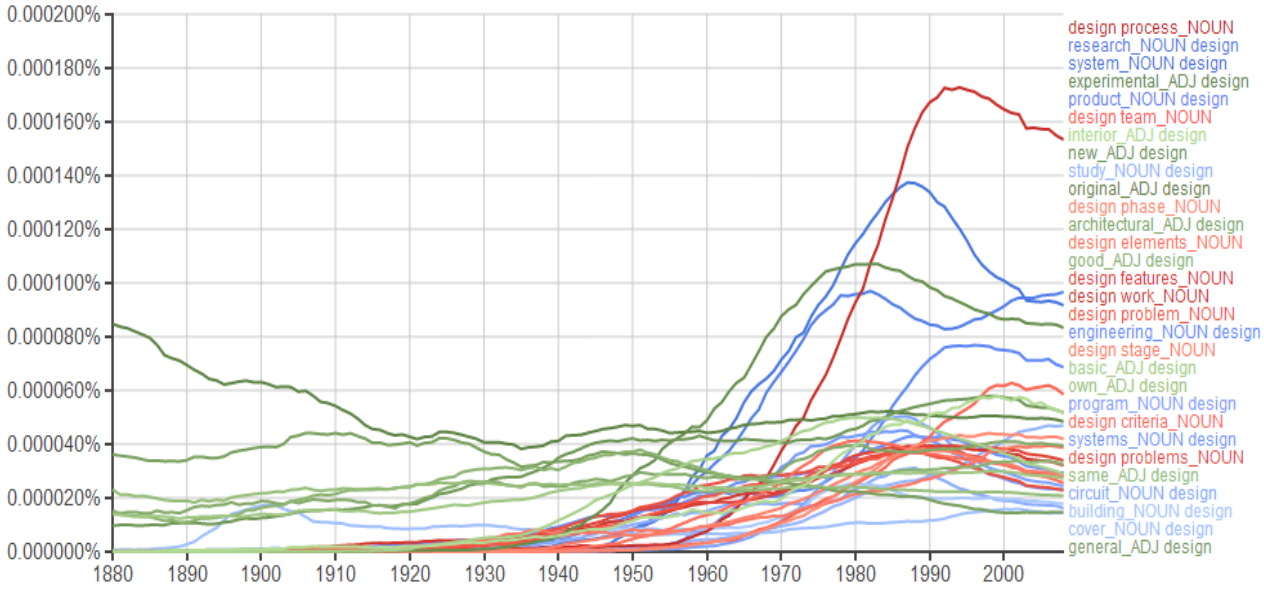
From the perspective of many design bodies, the main users are policy makers and not necessarily the design community. Their aim is to develop policies about design-driven innovation to foster economic growth, evaluating their impacts. They are interested first and foremost in outcomes and their causes: who is creating value out of design and how. They are also interested in the supply side in terms of education and skills. Another user interest is the interaction between design and other forms of intangible investments. Finally, policy users would like to be able to make cross-country comparisons along the various dimensions of interest of design. Empirical evidence on design was considered by workshop participants to be critical for the analysis of:

- The extent of spillover effects from design-based knowledge and potential market failures, and whether this is common to other innovation activities or has distinctive features.
- The use and effects of intellectual property rights (IPR) and the portfolio of choices available as applied to design. We know little about the relative roles of different protection systems, how they impact design registrations and how those registrations in turn impact economic outcomes. Design rights are relatively rarely used in many countries, which may be due to the fact that the cost is perceived as too high compared to the benefit, or that the legal concept of design is too narrow.
- The supply of and demand for design skills and capabilities, including whether the high-level of multi-disciplinarity in design skills implies that the supply and demand of skills is not in balance: is the education/skill agenda modified by inherent characteristics of the design function?

Design means different things to different people (Ralph and Wand, 2009). A quick and simple assessment through Google Ngram of the use of the term design in the English language corpus of published books over time shows a clear emerging dominance of "design process" as the most used term.

Figure 19. Most frequent design terms in the English language literature

Noun and adjective combinations with design, case sensitive results



Source: OECD analysis, based on Google N-gram viewer. English language corpus. February 2014

For the purpose of measurement, it is therefore relevant to attempt to identify which are the idiosyncratic features of design, i.e. those that make it distinct from other approaches and that bring cohesion across the different possible interpretations of design. This can be investigated by attempting to formulate and answer questions such as a) who are designers; b) what are the outputs of design; and c) what is the process of design? Some of these questions have been explored in the context of the review of existing indicators of design. The perspective of design as a process is perhaps the more general and encompassing of the three, but it makes measurement more challenging on a practical basis given the limited degree of standardisation and codification of design practices.

Examples of potentially overlapping methods used by designers include:

- Techniques to develop understanding of total customer experience
- User-centred approaches
- Human-centred scenario creation
- Use of ethnographic field research methods
- Use of problem framing techniques
- Collaborative team design
- Divergent idea generation prior to selection process
- Use of visual thinking and expression tools

Some of these factors are embodied in the notion of "design thinking", an attempt to generalise the concept of design away from its tradition of making visual artefacts to a form of mental model, potentially applicable everywhere and to all social, economic and business problems. Based on Buchanan's (1992) seminal contribution on the role of design as an integrative discipline focused on tackling "wicked", i.e. ill-defined problems were both problem and solution are incompletely known. The notion of design thinking was further developed and popularised for business by IDEO, a famous design consultancy firm.

Brown (2009) describes 'design thinking' as a methodology that imbues the full spectrum of innovation activities with a human-centred design ethos, focused around a 3-sided system that incorporates inspiration (built on the circumstances or issues to be addressed in the design thinking process), ideation (the process of idea genesis and testing) and implementation (setting out the path to market or change in the organisation). Other perspectives of design abound and have been considered in the context of this project, some positive and descriptive and some more normative, specifying for example what a design-led approach should involve and noting that design should not respond to existing user needs but anticipate future ones and radical innovations.

5.2. Consultation with the design community on design concepts for measurement

Given the pervasive and broad ranging nature of design and its social interpretation, it was apparent in the project that it was necessary to attempt to identify which were the defining features of design as viewed by the main stakeholders. An informal consultation exercise with the worldwide design community was carried out by OECD in the summer and autumn of 2013 with support by external consultants. The consultation, carried out by means of a short online survey questionnaire, sought to elicit the widest possible number of views without pursuing statistical representativeness for any given population, and was widely circulated across networks. A total of 66 responses were ultimately collected from experts from design bodies, designers in specialist or general firms as well as some academics. Respondents were principally asked to rate their degree of agreement with a list of statements regarding the role of design and its link with innovation.

The alternatives offered were determined in the light of several sources of ideas for possible meanings of design in innovation. The sources included:

- A review of literature on the nature and meaning of design, covering theoretical and empirical work, undertaken as part of stage one of the study carried out by Madano Partnership on behalf of OECD. This suggested some underpinning principles for testing in the survey.
- An expert workshop held at the OECD in February 2013discussed the literature review, the concepts of design for innovation proposed in different EU-funded projects, including "€-design" and cognitive testing with design related questions in the Community Innovation Survey. Contributors' suggestions for possible working definitions for measurement purposes have been adapted into a number of the concepts deployed in the survey.
- A pilot survey was distributed among several design policy and industry bodies in early summer 2013, to test the viability of the approach and to elicit further suggestions or refinements for use in the final form of the survey.

Table 4. How well do the following concepts represent design's role in innovation? Average ratings [1-5]

Concept	Average Rating
Design responds to user needs.	4.06
Design transforms concepts and knowledge into useful ideas and how to implement them.	3.91
Design improves the marketability of goods and services.	3.84
Designers create new ideas and aid their implementation.	3.71
Design is the link between creativity and the market.	3.65
Design enables and manages the psychological and social contexts and effects of innovation in goods and services.	3.57
Design is the creative stage of innovation.	3.49
Design is the link between technology and the market.	3.47
Design drives radical innovation in goods and in services.	3.46
Design enables more efficient production and distribution of goods and services.	3.37
Design for innovation is the application of a distinct set of professional skills.	3.34
Design is used for strategic decision making.	3.31
Design in services focuses on marketing or creating experiences.	3.25

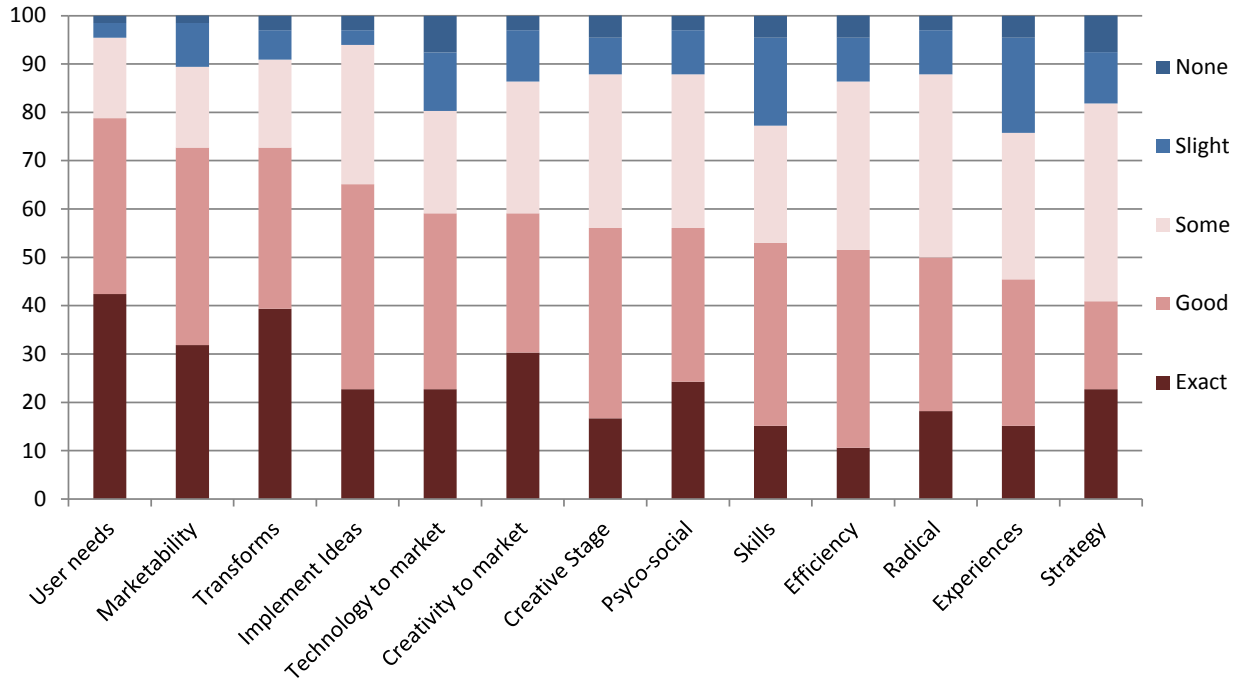
Source: OECD/Madano design expert survey, 2013.

The majority of respondents rated the suggested definitions as reasonably convincing, with all options showing a mean value of over 3, and thus reflecting good or exact representations (**Table 3**). But there is some heterogeneity across respondents, implying differences of appreciation behind the replies. The highest ratings are found for the item "Design responds to user needs", closely followed by "Design transforms concepts and knowledge into useful ideas and how to implement them" and "Design improves the marketability of goods and services". In short, respondents highlighted design as a creative, user and market-oriented activity. In contrast, the option that "Design in services focuses on marketing or creating experiences" has the lowest average ranking and the highest share assessing it as "none" or "slight" in representing design role in innovation. "Design is used for strategic decision making" has the second lowest average ranking and the lowest share of respondents rating it as a "good" or "exact" representation of design in innovation (**Figure 19**).[18] These aspects may be considered as least supported – even if not outright rejected – by expert opinion as dimensions for revising design coverage in the innovation measurement system.

18. The response may also reflect respondents' appreciation of there being a limited degree of adoption of design as core to strategic decision making in firms. It is interesting to note that, despite the low average score, more than 20% of respondents consider this an "exact" fit, which may indicate this is a strong discriminating factor across respondents based on their experience.

Figure 20. Distribution of ratings for design concepts

As a percentage of all responses, by concept-item



Source: OECD/Madano design expert survey, 2013.

Respondents were also given the opportunity to write in their own ideas on the meaning of design in innovation. Forty participants made suggestions for the role of design in innovation. The majority of these comments related quite closely to the definitions already provided in Question 1, and were often elaborations on one of these. For example, the largest share of comments relates to the importance of design in capturing and focusing innovation on the needs of users. "Design contributes to innovation by adopting a human-centred approach to both understand and engage people in change processes."[19] Other common themes that emerged from these comments referred to design as a tool of, or means of innovation, of translating ideas and of solving problems. Again these comments reflect a number of the definitions provided in the previous questions, such as 'Design transforms concepts and knowledge into useful ideas and how to implement them" and "Designers create new ideas and aid their implementation." Other comments referred to design's role being linked to increasing the marketability of products and services. Other general comments on the survey were that design and innovation work together very closely and have joint impacts, pointing to the economic notion of complementarity. One respondent discussed how poor design can negatively affect innovation, leading an original idea to fail in the market. This contribution draws attention to the importance of quality of resources and their application- an important but under-developed area for innovation measurement. Effective innovation is supported or enabled by good design, not just design for its own sake.

19. This interpretation would exclude types of technical design focused on the physical performance of product or process, for example wing design to improve fuel efficiency. The interpretation could be expanded to a broader notion of user-centred, in which the user, an airline, indicates a preference for fuel efficiency *vis à vis* speed or other performance features.

Table 5. Factor analysis of design concept items

Three main factors and rotated factor loadings

	Factor 1	Factor 2	Factor 3
Interpretation of factors **Design concept item**	***"Design as user-centred creativity"***	***"Design as a link to the market"***	***"Design as capability"***
Design for innovation is the application of a distinct set of professional skills.	0.1782	0.1153	0.7847
Design in services focuses on marketing or creating experiences.	0.0364	0.4867	0.6438
Design enables more efficient production and distribution of goods and services.	0.3839	0.3475	0.6245
Design is used for strategic decision making.	0.424	0.1036	0.599
Design is the link between creativity and the market.	0.2728	0.6677	0.497
Designers create new ideas and aid their implementation.	0.7843	0.1205	0.3328
Design drives radical innovation in goods and in services.	0.6406	0.2234	0.302
Design is the link between technology and the market.	0.2817	0.7913	0.2734
Design enables and manages the psychological and social contexts and effects of innovation in goods and services.	0.6261	0.4032	0.2576
Design is the creative stage of innovation.	0.7118	0.1349	0.2228
Design transforms concepts and knowledge into useful ideas and how to implement them.	0.7065	0.4185	0.2021
Design improves the marketability of goods and services.	0.3192	0.8525	0.0933
Design responds to user needs.	0.7622	0.229	-0.0021

Source: OECD/Madano design expert survey, 2013.
Note: Factor extraction method based on Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalisation.

Factor analysis tools were applied to responses to synthesise the various statements into core design concepts potentially subject to measurement. The analysis reduced the landscape from 13 items to three main factors, which on the basis of their correlation with the underlying statements on design, are interpreted as indicating the extent to which design is viewed (**Table 5**). By order of observed variation in responses accounted by each factor, views on design are shaped according to the extent design is:

- A **user-centred, creative development activity driving innovation**, with considerable analogies and potential overlaps with the Frascati definition of research and development. To some extent, this represents an inversion of the linear model of innovation, where usage considerations drive the creative efforts to ensure the implementation of ideas as potentially radical innovations. This dimension highlights the role of design integrating the development and implementation of innovations. A tentative definition that might emerge from this rather broad perspective, overlapping with the D (experimental development) in R&D, would thus be along the following lines:

  "creative, systematic efforts to conceive and develop entirely new, enhanced or adapted goods, services, processes and systems, whose modified properties can help address actual, perceived or potential user needs"

- A **link between the innovation activity of the firm and the market**. This dimension galvanizes the role of design described in the *Oslo Manual* as a key activity in the preparation of product and process innovations, and in efforts to modify the appearance of existing goods and services and how these are perceived. This dimension thus highlights the common factors that underpin the ability to bring to the market new or existing products and integrate the functions and the aesthetics into a combined offering. This factor also matches rather closely the context in which the term design is frequently used in non-English speaking countries.
- An **organisation or business capability**, with an emphasis on the skills, resources and strategies required for innovation which are currently underplayed in the *Oslo Manual*. This brings together concepts of design as a set of skills, in-house or outsourced, and as enabling efficiency in production and use in strategic decision making. The implication is the integration of design into core business operations.

Factor 1, Design Leading, is the dominant factor in that it accounts for over 50% of the variance, whereas Factor 2 accounts for 9% and Factor 3 for 7%. This reflects the extent of correlation of respondents' rankings across dimensions, in other words, which are factors that account for most of the observed reporting differences. These are not of course the only interpretations possible, but the reduction of the survey data to three indicators that cover plausible purposes and effects of the design function in innovation can be helpful in revising the basis for covering design effectively and parsimoniously in the innovation measurement framework.

Box 4. Relevance of findings to theoretical concepts of design

The options in question 1 were also informed by some of the theoretical positions set out in preliminary review work. The following table maps up the theses behind these positions (largely oversimplified) and what the survey findings have to say about them.

Theory	Main thesis (oversimplified)	Survey findings
Design as science of the artificial (Simon, 1996)	"Design is the transformation of existing conditions into preferred ones"; "[a designer] devises courses of action aimed at changing existing situations into preferred ones." Simon posited that agents do not have perfect knowledge and satisfice rather than optimise so design is an empirically grounded theory of problem solving with limited information, a "science of the artificial" or a "science of design", dealing with man-made objects. Design and creativity as forms of problem solving thus suit the practice of product and process innovation.	A considerable number of respondents suggested that design should be seen as future focussed. The science / discipline perspective was ultimately excluded from the final list presented to firms to keep a manageable number of items and therefore was not directly tested.
Design as link between concept and knowledge (Hatchuel 2001)	This framework was developed from Simon's theory and views design expertise as applied in the transformation of new concepts, in conjunction with extant knowledge, into useful ideas and how to implement them.	"Design transforms concepts and knowledge into useful ideas and how to implement them" was ranked second with an average rating of 3.9, implying considerable support from the design community.
Design thinking (Rowe, 1991; Brown, 2009).	An evolution of the above adapted for business purposes, influenced by work of IDEO and Stanford-based designers, presents an approach or process for linking understanding of the business objectives and the market (inspiration) with the ways of incorporating desired characteristics (of goods or services) into offerings (ideation) and delivery or choreography of the user experience (implementation) (Brown, 2009).	"Designers create new ideas and aid their implementation" which is close to Design thinking- is fourth ranked with a score of 3.7. Formulated as a business process, it is fairly close to the notion of design as capability while in its purpose it clearly resonates with the two main factors.

Design driven (Verganti, 2008)	Design is conceived as integrating product ideas with psychological and social needs, but principally through radical market propositions. Part of the argument in this theory is that "user focus" has been over emphasised in design studies and is likely to lead mainly to incremental change. Design is used by market leaders to develop novel innovations that change user and social perceptions.	Concepts close to this position - "design managing psychological and social contexts" and "design driving radical innovations" - are ranked 6th and 9th respectively. But they also load together with the creativity related propositions to form a complex indicator (factor). Survey result that top-ranked concept is "*responding* to user needs" however indicates that radical proposition is not accepted in mainstream (and may confirm continued overemphasis critique).
Service design (Shostack, 1982)	This design process can be documented and codified using a "service blueprint" to map the sequence of events in a service and its essential functions in an objective and explicit manner. It is an emerging field of academic research and business applications that has roots in the services marketing literature and in the study of the user interface elements in computer software. An important aspect is designers' understanding of the "customer journey" and how to orchestrate it to maximise the utility of the experience of a service.	The top ranked concept is the "importance of user needs." But the specific proposition that "design in services focuses on marketing and experiences" is lowest ranked. This may reflect the rather restrictive framing of the idea, as well as a continued association of design with physical products so that service design is mostly considered as a different type of activity.

Overall, the results appear to confirm the existence of support for a set of design and innovation concepts that map well onto central tenets of innovation measurement. The user focus of design is the highest rated element cited by respondents, followed by concepts related to the creation and implementation of ideas in the market.

Furthermore, design experts views can be characterised in relation to three simple dimensions, namely the extent to which they view design:

- as a user-centred creative development activity;
- as link to the market, easing the introduction of new products; and
- as an organisation's or firm's capability, within its business processes and strategy.

The first dimension is rather novel with respect to existing measurement guidelines but resonates with notions present in both Frascati and Oslo Manuals, particularly the former. This suggests that the practical challenge would be to identify what design development efforts are not already captured by R&D statistics. The second dimension encapsulates the description of design provided in the *Oslo Manual*, related to supporting the introduction of new products and processes, and to a lesser extent, the introduction of marketing innovations that modify the appearance of products. While the building of design capabilities could be linked to organisational innovations, the third dimension is not explicitly captured in the two manuals but has potential linkages to OECD efforts to expand the measurement towards knowledge-based capital and human resources engaged in S&T and innovation activities.

The results are broadly consistent with the definitions underlying the €-design project and the Danish CIS design questions, but go beyond their coverage into more multivariate concepts for measurement. The concepts "Design in services focuses on marketing or creating experiences", and "Design is used for strategic decision making" are least supported – even if not outright rejected – by expert opinion as dimensions for revising design coverage in the innovation measurement system.

6. Business views and understanding of design – results from cognitive interviews

A number of approaches for eliciting business responses on their development and design activities were tested through in-depth cognitive interviews with 17 business managers from various countries with support from an expert independent consultant, splitting them into two separate groups presented with different questions.[20] In this round of testing, in response to company reported problems in round one to separate **financial measures of their innovation activities** from their ongoing, routine activities, an attempt was made to isolate innovation development efforts from actual innovation implementation efforts. This failed, as companies struggled to separate between these categories and often found that development and implementation, two key and different concepts in the *Oslo Manual*, were also indistinguishable. This is consistent with the experience in innovation surveys, that most companies report having developed innovations by themselves. In light of this experience, and in the absence of administrative, subsidy-related or other incentives to report innovation expenditures other than R&D, it seems unfeasible to aim to collect internationally comparable, across different size classes, data on innovation expenditures. Companies did however tend to indicate a general ability to report, on an approximate basis, the size in human or financial terms, absolute or relative to turnover, of their functions related to specific areas such as engineering, design, training, etc… but not necessarily as related to innovation. This is more promising from the perspective of measuring efforts to undertake KBC-related activities.

However, companies were able to provide answers to **simple questions on the role of design** in their companies as long as some initial, impressionistic description was also provided to them. Responses from the interviewees were consistent with their companies' actual activities, notwithstanding a slight tendency to overstate the extent to which design is integrated and plays a strategic role in the firm's activity, possibly a by-product of the personal nature of the interviews. Furthermore:

- Respondents had a broad based view of design, recognising in their own business experiences uses of design relating to physical products, experiences and services, corporate identity, product aesthetics and emotions, functional roles and the integration of functionality with appearance and emotions.
- Likewise, the range of respondents identified links to all types of innovations contemplated in the *Oslo Manual*, including new processes.
- Most business respondents appear to view design, in the context of the markets in which they operate, as driven by innovation or enabling it, rather than being the driver of innovation. This indicates a lack of support in the mainstream for the strongly held support amongst the design community that design leads radical innovations (Verganti, 2008).
- Respondents also recognised a wide range of possible sources of design capabilities. Some firms identified design with teams of specialised "creative types", some recognised design skills across a wider range of occupations such as those considered in the KBC skills OECD work, and a few also noted the importance of design capabilities in managerial positions.
- The specific question used in Denmark's innovation survey was tested with a separate set of 8 companies and proved to be fairly well understood, with respondents willing to volunteer information on whether design was done in-house or outsourced. Again, further probing revealed a slight tendency to overstate the degree of design integration, which can be potentially managed by following up with a number of itemised questions. In the case of the Danish micro-data, only 15% of firms reporting a high degree of design integration did not tick any of the follow on questions.

20. For more details on OECD work on cognitive testing, see Galindo-Rueda (forthcoming).

7. Conclusions and implications for the future measurement and analysis of design

The OECD/NESTI project has identified, through available and experimental measures and analysis, considerable evidence for the integrative role of design and designers between creative development efforts, the practice of innovation in firms, and the implementation of innovations in the marketplace. It is not only an activity carried out by specialised personnel in specific settings, but is also a process that can systematically influence most of the activities usually contributing to business innovation projects.

However viewed, the "integrative" features of the design process are most probably not exclusive to design activities or design professionals in any particular way, hence the difficulty of deriving classifications with mutually exclusive categories in which design can be unambiguously represented. Nonetheless, it is important to note that this is not the only possible use of indicators and analysis on design. The results from the analysis of Denmark's innovation and design micro-data clearly point out that qualitative indicators can help account in part for the observed heterogeneity in innovation and economic performance of firms, regardless of the direction of causes and effects which need to be better understood. It is thus important to refine the approaches to ensure a rich coverage of the most relevant design concepts, using surveys as relevant but also complementary approaches such as those described in the review of measurement efforts. As a minimum requirement, statistical coverage requires that design as reported by firms is a systematic and deliberate business activity representing a formal relationship between the designer (in a broad or strict sense) and the customer, possibly in the framework of projects and/or defined team roles. Whether there is a unifying framework for design or not, is probably of little relevance for statistics and their practical usage.

Table 6. Avenues for capturing different dimensions of design

Main concepts proposed by designers	Integration of…	Potential measurement approaches based on project findings
User-centred creative development – design led innovation	Creative development and implementation User and producers preferences and constraints	• Strong analogies with R&D but difficult to identify overlap and incorporate in Oslo or Frascati surveys • Workforce skills and tasks measures • Questions on user methods • Design ladder questions and probes • Analytical approaches linking these elements and measures of innovation outcomes – to identify the outlier radical, design driven innovators

Link innovation to the market	Function and appearance
	
	Technology and market
		• Oslo innovation questions
		  o New or improved attributes probing
		  o Innovation activities – design category
		• Questions on user methods

Design as capability	Teams and strategy	• Design ladder questions and further probes • Workforce measures – design competences in managers

Table 6 identifies a tentative mapping between the concepts principally favoured by design experts and their most promising measurement strategies.

7.1. Design in the revision of the Frascati Manual

This ongoing NESTI activity, formally initiated in 2013 and expected to be completed in 2015, is reviewing the guidance on how to draw the boundaries between R&D and other related activities. For the purpose of collecting R&D statistics, design presents common challenges to those presented by software, in that it is possible to identify design and software development activities that can be legitimately described as experimental development (the D in R&D). NESTI is deciding to what extent it is possible to provide explicit guidelines and examples that assist practitioners and survey respondents in differentiating between design activities that correspond or not to R&D, for example, by reference to concepts regarding uncertainty and novelty in development endeavours, to separate from routine activities and those not necessarily expanding the stock of knowledge. Stakeholders have been invited to provide feedback on existing guidance and put forward relevant examples through an open consultation [www.oecd.org/fr/sti/inno/frascati-manual-revision.htm]. It is very important that the revised *Frascati Manual* provides a coherent description of what design entails, independently of any attempts to define it, in a way which is coherent with the *Oslo Manual* and the reality of design.[21]

While it may be argued that there is potential user interest in securing estimates of the degree of overlap between R&D and design, quantifying the proportion of relevant R&D expenditures that are design-based does not appear to be feasible at present due to a lack of demonstrated approaches and limited scope for adding new questions in R&D surveys. It is therefore unlikely that any forthcoming guidelines will include recommendations in this particular respect in the short to medium term.

7.2. Design in the review of the framework for measuring innovation – the Oslo Manual

Innovation surveys were developed to increase knowledge about innovation in firms, with the dual purpose of improving the understanding of the processes and outcomes of innovation and helping formulate and assess innovation policies. Despite their limitations, they have helped support a broader understanding of how innovation occurs in firms and reduced the traditional identification of R&D with innovation, moving beyond a narrow technological view of innovation. Ten years have almost passed since the OECD and Eurostat jointly released a revised, third edition of the *Oslo Manual* on measuring innovation (OECD/Eurostat, 2005). Evaluation of the treatment of design provides a major element for assessing the performance of the manual and the areas in need of review and potential modification. For example;

- Innovations are assessed in relation to the novelty of attributes in the products introduced to the market and methods adopted by firms. Design impacts directly on a number of attributes which then impact on the efficiency of firms' processes and the utility experienced by customers and willingness from the goods and services supplied.[22] The various modes of design can be used to pursue further steps to continue the emphasis on the novelty of innovations to the market.

21. Design is associated with drawings and blueprints (§85) and a rather blunt and unqualified statement is made: "The vast bulk of design work in an industrial area is geared towards production processes and (…) is not (...) R&D. There are (…) some elements of design work which should be considered as R&D. These include plans and drawings aimed at defining procedures, technical specifications and operational features (..) *for* conception, development and manufacturing of new products and processes." (§124)

22. It has to be noted that firms often reject the idea of having changes in product form and appearance that do not alter the product's functional or user characteristics described openly as innovations.

- Within the Oslo framework, design is primarily an "innovation activity".[23] In this perspective, it stands along other activities that contribute to development and implementing innovations. Actual data collection in innovation surveys has made clear that such a distinction is not straightforward, neither for statisticians nor for survey respondents. The approaches considered above provide auxiliary information to help qualify what is design activity and what forms it can adopt.
- The open collaborative nature of design activities provide a test case for identifying to what extent companies co-develop and co-implement innovations.
- The explicit or implicit reporting of design as part of innovation expenditures. As noted earlier, this remains a strong challenge and the diversity of national practices, illustrated in **Table 2**, indicates that countries and organisations like Eurostat have come to very different conclusions as to how to go about collecting these data. Given the accumulated experience, it is not inconceivable to consider a move towards asking questions on financial efforts on items such as design and training regardless of the innovation status of firms, as proposed in the context of ad hoc "intangibles" surveys.

2. The process for revising guidelines such as the Oslo and Frascati Manual requires the input of practitioners who propose specific examples and uses of design so that an appropriate statistical representation can be identified by the NESTI and widely disseminated. For example, **Annex 1** provides a set of tentative examples that illustrate the overlap between design, R&D and innovation activities, intended to help initiate a broader dialogue with the user community which NESTI can consider in its work.

7.3. Implications for analytical activities and policy research on design

3. Identifying potential mechanisms for measuring design and producing indicators will not by itself satisfy the needs and expectations of policy users. Potential questions concern the private and social rate of return to design investment, the extent of spillovers from design activities, the most appropriate protection frameworks for design outputs, the case for or against financial reporting requirements, the relevance of raising awareness and links within the design community, or the potential promotion of design skills and capabilities in firms, the workforce and the youth. Dealing actively with these questions requires an ambitious research agenda to be laid down. Identifying and addressing data gaps is a necessary step, which must be supported by the means for linking data sources and policy experiences in analytical setting. This agenda requires first and foremost a continued dialogue to identify which are the specific questions of interest for policy makers and how they can be tested empirically.

23. A new design can possibly be an innovation (a new product) in its own right if, for example, a specialist "designer" firm brings it to the market by licensing it to other firms.

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Annex 1. The overlap and differences between R&D, design and innovation activities – mapping out some possible examples