

WP 2 – MEASURING DESIGN Guidelines and Research Report

May 2013

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WP2 - Conceptual and qualitative research to identify initial hypothetic guidelines for the measurement of design as a factor of production and as a user-centred innovation tool

The objective of this work package is to shape the initial guidelines for analysing and measuring the economic impact of design efforts and design outputs, thereby facilitating more detailed and robust measurements of design.

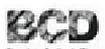
One of the objectives of shaping new initial guidelines is to enhance statistical analyses of design in order to enter the Frascati family of Manuals for R&D and for Innovation.

We will identify the relevant input and output parameters to measure efforts in design as an innovation tool and its resulting value creation. From these parameters we will formulate new questions which could be included in future Community Innovation Surveys (CIS). Further as a possible second approach an extended survey could be developed with focus on user-centred (design) innovation. The availability of data from future surveys then has the potential to open the door to future investigations of causality. The first step will be to draft a set of possible questions to be used in a future CIS or possibly in a new questionnaire, in order to capture data for measuring design. The goal is to identify the most relevant input, intermediate output and final output parameter data.

This data will also enable firms and policy makers to understand the effect of design efforts in innovation processes and make their strategic decisions accordingly, within the complex, systemic and increasingly open nature of innovation.

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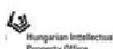
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Summary

Lack of alignment of previous design surveys with the €design definition

€design proposes the following definition: “*To design is [to focus on] the integration of functional, emotional and social utilities..*” With this definition as a basis, we conclude that so far, no previous measurement of design has been sufficient, and in previous attempts, design has either been too narrowly defined or not defined precisely enough. A new measurement tool is therefore needed.

The Community Innovation Survey does not treat design in a satisfactory way

The CIS is based upon the Frascati and Oslo manuals and is the EU standard for capturing firm level data on innovation activity and expenditure. However, design is largely excluded from this approach and where it is included it is misleading and not representative of design as defined here.

An improved treatment of design activities in CIS – guideline for testing

Proposed here are two ways in which the treatment of design might be improved, each building on the existing structure of the CIS. The first is a significant change which treats design as a significant and integrated component of innovative activities. The second is an alternative demanding less alteration to the CIS but with a lesser degree of precision in the capturing of data. These two alternatives will be tested alongside the CIS original in the next phase of the €design project, with participants from firms in six EU nations.

1 Introduction

1.1 Tasks

WP2 aims to proceed from WP1's conceptual framework and bring this to a set of operational guidelines regarding the improved measurement of design within the Community Innovation Survey (CIS).¹ WP2 also proposes a framework for how the average impact of design as a factor of production can be assessed by the collection of CIS-type enterprise data.

The next phase of the €design project, WP3, will implement the guidelines in the testing of measures of design in order to gain evidence for final formulations of the measurement tool, the €design definition of design and its alignment with recent measurement experiences. The WP2 contribution is limited to the information given by the population of enterprises. In this respect the contribution of design in consumer surplus is not considered albeit this is identified as an important component in WP1. The limitation to enterprise level data will in principle also imply restrictions on the measurement of human skills and the distribution of tasks in the enterprise labour force, a perspective which has given attention recently.²

The WP2 report is divided in two sections. The first section consists of two chapters. The first chapter makes a brief description of previous surveys on design and the result whether this can be utilized with respect to the proposed conceptualisation of design of WP1. The chapter ends with a brief outline on design as an integrated input, intermediate output and outcome in the context of the CIS. In the second chapter guidelines are presented to show how to improve the CIS with respect to the WP1 definition. These guidelines are supplied without explanations. However a more detailed discussion can be found in the second section of the report. The second section of this WP2 report consists of 7 annexes supplying a more thorough overview on previous measurement models and references to literature used.

1.2 Alignment with earlier measurements³

In principle we will try to “test” the alignment of earlier measurement of design to the concept of design defined by WP1:1 (Table 1). From Table 1, it is clear that in previous work, a wide range of approaches have been taken to defining or placing a boundary around design.

We find that none of the listed surveys have a description of design that is coherent with the proposed definition of the €design project:

To design is [to focus on] the integration of functional, emotional and social utilities. (€design January 2013 §26)

In Table 1 one also finds different variants of measures of expenditures. Listed explicit design surveys do not measure expenditures directly but via the number of staff working with design. In order to measure expenditures one thus needs secondary sources of

¹ See €design WP1 Analytical Framework Paper

² €design WP4 will contribute on the consumer perspective. For the application of work tasks and design see Annex 5

³ See Annex 2 for a more thorough presentation.

information regarding salaries. All surveys acknowledge the need to measure design services purchased externally of the enterprise.

Based on the presentation in Table 1 the conclusion is that no present survey on design is directly malleable for the purposes of the €designproject.

Table 1 Overview of recent surveys that measure design expenditures⁴

Country	Survey	Formulation	Expenditure related measures:	Strategic related measures
DK	Design survey 2003 ⁵	“When we speak of design we mean design strategies, development and styling – everything that takes place prior to production of implementation of products (printed matter, sales fair stalls, web sites, interiors, etc.).” p6	<ul style="list-style-type: none"> • Number of design professionals employed • Does firm purchase design externally • Size of external purchase of design 	<ul style="list-style-type: none"> • Design ladder
DK	CIS 2010	<p>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.</p> <p>Development of new goods and services, new areas of business activity and organisation, brands</p>	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Design ladder • Incidence of “experience” related activities
Sweden	Design survey 2008 ⁶	<ul style="list-style-type: none"> • Design implies a professional and creative work in which functional and aesthetical demands are of critical importance. • The need for design emanates from product development and market communication. • Industrial design, service design and design management are all aspects of product development. • Market communication implies graphical design, interior design and exposure. 	<ul style="list-style-type: none"> • Number of staff that work primarily with design w r t product development • Number of staff that work primarily with design w r t communication • Number of prof. designers employed w r t product development • Number of prof. designers employed w r t communication • Proportion of expenditures on design • Internal/external 	<ul style="list-style-type: none"> • Design ladder
Austria	Departure, Microgig	By design, we mean the entire process that gives products or services a certain form and function - ranging from cars to paper clips to cell phones, from clothes to chocolate, from websites to financial services. To make products function in	<ul style="list-style-type: none"> • Number of staff with a “superior” design education • Number of staff working fully/partly with 	<ul style="list-style-type: none"> • Design ladder

⁴ Table 1 is limited to actual measurements, however OECD has also recently surveyed experiences in design measurements see “Measuring design and its role in innovation” DSTI/EAS/STP/NESTI(2013)7

⁵ http://www.ebst.dk/file/1924/the_economic_effects_of_design.pdf

⁶ http://www.svid.se/upload/For_foretag/Undersokningar/Svenska_foretag_om_design_2008.pdf (in Swedish unfortunately)

	ant & IFES ⁷	the desired manner, various design requirements must be considered, i.e. aesthetical, functional, user-friendliness, product comfort.	design <ul style="list-style-type: none"> • Complete costs of design • Proportion of expenditures on design • Internal/external 	
France	2005 ⁸	No definition, design is what designers do	<ul style="list-style-type: none"> • Which enterprise area is Design related to: Management, Marketing, Production, Purchase, R&D • Expenditures on (3 brackets of expenditure intervals to choose from): Products design, Packaging design, Graphic design, Interior design • Number of designers employed 	•
UK	2008 ⁹	<p>Livesey&Moultrie measures 4 dimensions of design.</p> <p>Design in the creation of products and services.</p> <p>1) Design relating to the technical/engineering aspects of creating products and services.</p> <p>2) Design of the user experience in the creation of products and services.</p> <p>Design in the communication, promotion and delivery of products and services or the overall business.</p> <p>3) Design as part of promotion, communication, branding and distribution of products and services.</p> <p>4) Design as part of developing promoting, and communication the corporate identity.</p>	<p>Expenditures on</p> <ol style="list-style-type: none"> 1) Technical design 2) User design 3) Promotion, communication, branding design 4) Corporate identity design <p>For each a measure of precision was asked for</p>	
UK	NESTA ¹⁰	The design of products or services to improve their look or performance, web	Yes/no	

⁷ http://www.departure.at/jart/prj3/departure_web/data/uploads/website_downloads/2011/Netzwerkaktivitaeten/Study_Design_Ladder.pdf?dlink-ran=1339684669682.

⁸ <http://www.industrie.gouv.fr/biblioth/docu/dossiers/sect/pdf/rapdesign.pdf>. Note that the actual survey was made for the conditions year 2000

⁹ Livesey & Moultrie (2008) http://www.ifm.eng.cam.ac.uk/dmg/documents/090406company_design_spend.pdf

¹⁰ The questionnaire is found at the ONS website "Survey of business expenditure on intangible assets" <http://www.esds.ac.uk/findingData/snDescription.asp?sn=6701&print=1>

		designs etc. Exclude design of scientific prototypes (part of R&D) and design of software.	Expenditure on external design Expenditure on design carried out by own staff	
CIS	UK	<ul style="list-style-type: none"> Product development: All forms of design. Engagement in design activities for the development or implementation of new or improved goods, services and processes. Design activities in the R&D phase of product development should be excluded. 	Incidence of activity in recent 3-year period Yes/no and Expenditure on "all forms of design" for most recent year	Context for innovation Increasing range of offerings New markets Increase market share Increase product quality Reduce costs Increase value added <i>And more...</i>
CIS	Eurostat	<ul style="list-style-type: none"> Product development: In-house or contracted out activities to design or alter the shape or appearance of goods or services. Market introductions of innovations: Activities to design, improve or change the shape or appearance of new or significantly improved goods or services. 	Incidence of activity in recent 3-year period Yes/no Expenditure on design is aggregated into "other innovations activities" not specified explicitly for most recent year	Objectives for innovation New markets Reducing costs Introducing new goods and services Improving marketing Increasing flexibility

1.3 Design as a factor of production

The context of CIS is the single enterprise which can be part of a group (larger corporation or an independent entrepreneur). The CIS tries to measure new matters that the enterprises experience during the recent three years. The focus on the enterprise puts CIS naturally into a production or supply perspective.¹¹ The only monetary performance indicator in the CIS is the question regarding the enterprise turnover. Given the perspective of the enterprises this has two implications. The first is that an enterprise which has not experience any sales has not produced any values. The second is that turnover is a crude indicator of the value produced in the firm. In economics literature the value created in the firms is measured by the concept *value added*. Value added is commonly defined as the enhancement of inputs an enterprise produces and offers to its customers at a certain price. More precise the definition is: the enterprise turnover less external purchases which is equivalent to the sum of profits and expenditures on labour.¹² The turnover should cover all kinds of costs not only the profits and the salaries which makes this a less suitable measure for value creation. In principle this can be handled by comparing the levels of turnover conditioning on for example the average in the enterprise main industry.

In the CIS-context the main outcome measure is thus the turnover. The main output measure is the introduction of innovations. In the CIS these are also combined as the turnover from new products introduced recently as proportion the most recent year.

Design as a user-centred innovation activity focuses on the integration of the functional, social and emotional utilities that a good or service delivers to users. The integrating function of design is independent of the location in the business hence design has to be measured in all kinds of activities in the enterprise.

Thus the input character of design activities is primarily human skills in identifying and acting adequately on such user values. These skills are applicable in different innovative activities like research, development and marketing and training. The aim to more adequately measure design does not change the sequence of input, output and outcome in the CIS but it will be relevant to identify to what degree design has been part of the new or improved items.¹³

In the CIS the strategic or competitive position is acknowledged in influencing the innovative activity of the enterprise. Thus the intentional aspect of enterprise conduct needs to be considered from a design perspective as well. In accomplishing the chosen strategies (implicit or explicit) enterprises also make use of different kind of linkages to external knowledge sources. At present three kinds of linkages are measured in the CIS questionnaire, information sources important for the completion of innovation projects, purchase of external knowledge and formal collaborations. We have not found the linkage items in need for alterations when looking at the CIS from the design perspective.

Can the impact of design as a factor of production be estimated? In Annex 1 we refer to a framework which estimates the average return on R&D investments as an analogy to

¹¹ €design WP1 has recognized that part of the value that design creates is not possible for the enterprise to appropriate and thus is identified as consumer surplus. See €design WP1 §16. In the WP4 of €design project analyses on the consumer perspective on design value creation will be treated in more detail.

¹² Depending on perspective the concept of “value added” can have different definitions here we refer to the one used in economics research which differs from the concept of e.g. EVA in corporate finance literature.

¹³ Note however that in the context of CIS the distribution of tasks among the enterprise labor force is not measured in CIS, see annex 5 for a discussion.

estimate the return on design investments. Whether this framework is sufficient to adequately measure the impact of design in a quantitative manner is however a matter for future research.

2 Design measurement guidelines

In the Community Innovation Survey (CIS), design emerges indirectly in several questions. Table 2 lists the sections where a design perspective is relevant. A forthcoming empirical task in WP3 is to investigate whether it is possible to collect this kind of information from the enterprises.¹⁴

This guideline outlines the testing of design measurement in the WP3 phase of the €design project. Enterprises will be tested for a general understanding of design in the CIS as well as three different sets of questions where the first set is the original CIS questions which are included to serve as a baseline. A second set of questions is designed to improve the CIS with respect to the €design perspective on design. The improvement is given in two varieties in order to enable to identify the more suitable one.

The target of the alternative questions is to supply CIS with a clearer description of design, one which enterprises can relate to, and to include questions on expenditures on design related activities.

In the WP3 phase of the €design project cognitive testing will be done in order to evaluate design relevance in the original questionnaire and secondly to test the proposed changes (the questions here proposed might be amended in the WP3 phase). The cognitive testing includes one-on-one interviews with 5 enterprises per country in 6 countries – a total of 30. Information from the first step will be generated and conclusions drawn so that a new improved questionnaire derived from alternative 1 and 2 can be created for a second phase of WP3 which consists of surveying 20 enterprises per country in the same 6 countries with a standardised questionnaire.

Table 2 General questions on the fit between design and descriptions and measures in the CIS

Section	Content	Questions to be asked of managers in firms
2	Description of product innovation	How does design fit in this section?
3	Description of product innovation	Is this an area where you can see design as a component?
4	On-going or abandoned innovation activities	Is the word activity clear? Does it need to be described?
5.1	Activities and expenditures for product and process innovations	How well does this set of activities reflects your view of design
8	Organizational innovation	Does design play a role in organizational innovation? If so, how?
9	Marketing innovation	How does design fit in this section?
11	Strategies	Design as a tool for reaching strategic goals
12	Basic information on your enterprise	In order to estimate returns with respect to value-added a new question needs to be included regarding total sum of outside purchases. Test if this implies that this creates a larger burden for the respondent.

**Note: Section refers to the Eurostat version of CIS*

¹⁴ The original CIS questionnaire can be found in the Annex 6. WP2 has no intention to change the order of the existing questions.

2.1 Improvement in the CIS w r t design; suggestions

In table 3 to table 8 below there are suggestions to alterations in order to improve the measurement of design in the present CIS. These are only first suggestions and probably will be further improved upon in WP3. The presentations in the tables below include texts from the original CIS questionnaire. In some places we suggest alterations that imply not only new material to the questionnaire but also the erasing of text which conflicts with our design perception.

Table 3 Alternative 1 changes to CIS section 2 (alterations by €design in *italics*)

2 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, and components of sub-systems.		
<ul style="list-style-type: none"> 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 or institutions. 		
2.1 During the three years 2010 to 2012, did your enterprise introduce:		
	Yes	No
Goods innovations: New or significantly improved goods (exclude the simple resale of new goods <i>and changes-of-a solely-aesthetic-nature</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Service innovations: New or significantly improved services	<input type="checkbox"/>	<input type="checkbox"/>
2. X What was the main character of the innovation?		
	Yes	No
a) <i>improvement</i> Functional	<input type="checkbox"/>	<input type="checkbox"/>
b) <i>improvement</i> Intangible <i>For example appealing to aesthetics/forms/ the consumer perception of meaning</i>	<input type="checkbox"/>	<input type="checkbox"/>
c) <i>of a) and b)</i> Combination	<input type="checkbox"/>	<input type="checkbox"/>

Table 4 Alternative 1 changes to CIS section 5 (alterations by €design in *italics*)

5. Activities and expenditures for product and process innovations
*Did your enterprise engage in the following innovation activities:
 For each activity indicate a your engagement during 2010 and 2012 and the expenditures of the engagement in the activity for 2012
 For each activity also indicate the proportion of **design** in 2012 where design should be understood as work with a user focus with respect to functional and intangible utilities. (Examples of the latter are aesthetical appearance, form and appeal to customer/user perception of meaning and identity.)*

With a lack of precise accounting data please use estimates

Innovation activity	Activity 2010-2012		Expenditure 2012	Estimated proportion of design in 2012
	Yes	No		
New knowledge				
In-house research	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Externally purchased research	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Development of new or improved products and processes				
In-house development	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Externally purchased development	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Market introductions				
In-house activities	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Externally purchased activities	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Training for innovations				
In-house or contracted out training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Acquisition of knowledge				
Acquisitions of know-how, copyrighted works, patented and non-patented invention, etc. from other enterprises or organisations for the development of new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Acquisition of Equipment				
Acquisitions of advance machinery, equipment ,software and buildings to be used for new or significantly improved products or processes	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Other				
Other in-house or contracted out activities to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering etc.	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%

Table 5 Alternative 2 changes to CIS section 5 (alterations by €design in *italics*)

<p>Given this definition, what proportion of investment in each of these innovation activities is design?</p> <p><i>For each activity also indicate the proportion of design in 2012 where design should be understood as work with a user focus with respect to functional and intangible utilities. (Examples of the latter are aesthetical appearance, form and appeal to customer/user perception of meaning and identity.)</i></p>							
	<10%	10-20%	20-30%	30-50%	50-75%	>75%	Don't know
<p>Creation of new knowledge (Research and development activities undertaken by your enterprise to create new knowledge or to solve scientific or technical problems (include software development in-house that meets this requirement)</p>	<input type="checkbox"/>						
<p>Development of product and processes</p>	<input type="checkbox"/>						
<p>Market introduction of innovations</p>	<input type="checkbox"/>						

Note: The intervals suggested must be based on empirical evidence on the frequencies in the population of enterprises

Table 6 Changes to CIS section 8 (alterations by €design in *italics*)

<p>Section 8 Organisational innovation <i>If your enterprise introduced any of the items specified in 8.1 please estimate how much spending in total of such innovative activities?</i> <i>For each activity also indicate the proportion of design in 2012 where design should be understood as work with a user focus with respect to functional and intangible utilities. (Examples of the latter are aesthetical appearance, form and appeal to customer/user perception of meaning and identity.)</i></p>	<p>Expenditure _____€</p>	<p>Estimated proportion of design in 2012 _____%</p>
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Table 7 Changes to CIS section 9 (alterations by €design in *italics*)

<p>Section 9 Marketing Innovations <i>If your enterprise introduced any of the items specified in 9.1 please estimate how much spending in total of such innovative activities?</i> <i>For each activity also indicate the proportion of design in 2012 where design should be understood as work with a user focus with respect to functional and intangible utilities. (Examples of the latter are aesthetical appearance, form and appeal to customer/user perception of meaning and identity.)</i></p>	<p>Expenditure _____€</p>	<p>Estimated proportion that relates do user centred functional and intangible utilities _____%</p>
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Table 8 Changes to CIS section on enterprise strategies (alterations by €design in *italics*)

Section 11.2 During 2010 to 2012, how important were each of the following strategies for reaching your enterprise's goals?

	Degree of Importance			
	High	Medium	Low	Not relevant
Developing new markets within Europe*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developing new markets outside Europe*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reducing in-house costs of operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reducing costs of purchased materials, components or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Introducing new or significantly improved goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Competing by offering lower cost to customers</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Competing by offering improved performance and functionality</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Competing by offering improved user experience in appearance, packaging and branding</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intensifying or improving the marketing of goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increasing flexibility / responsiveness of your organisation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Building alliances with other enterprises or institutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Table 9 Changes to CIS section 12 (alterations by €design in *italics*)

Section 12: After 12.2 insert	
<i>What was your enterprise's total cost for labour inputs</i>	_____ €
<i>What was your enterprise's total purchase of inputs (goods and services)?</i>	_____ €

Annex 1: Measuring the return of design in the production function framework

In several surveys the ambition has been to merely measure the amount of expenditures enterprises spend on design. When referring to *design* as a factor of production/factor of innovation the ambition of the measurement is increased, underlining the outcome in value-added that stems from design. Besides suggesting a quantitative measurement of design, €design also needs to show how this measurement is represented in context/model at the micro/case level.

At best this model should not merely indicate a positive correlation between expenditures and outcomes but also a causal one. There are several problems with this endeavour besides the problem of adequate measurement of the expenditures. This section primarily refers to literature on estimating the returns on R&D due to the similar treatment of R&D and design as both factor with the object to create innovative outputs. The common model of relating factors of production and economic output is presented. The problem of simultaneity is noted and the problems in the CIS of correctly estimating the effect will also be discussed.

Like R&D design activities can have different kinds of ‘outcomes’. In a specific enterprise design can decrease production cost by considering the production process for a given product. Likewise design activities can improve the quality of the product and thus allow a price increase without increasing cost at the same proportion. Design activities can also improve the variety of offerings. Thus design activities (like R&D) will affect profits, prices and spur a reallocation of factors of production. Successfully implemented design activities in one firm will most surely be imitated in other competing enterprises. This income which the inventor cannot attribute is in economic jargon called a spill-over effect. As WP1 illustrated, there is also a spill-over effect at the final consumer level; when the perceived consumers benefit, measured as the ‘willingness to pay’, is higher than the market price charged.

Design activities, like R&D activities, can be expected to show economic outcome both at the firm level as well as wider effects. Below we will only focus on the effects design has as a factor of production or a factor of innovation, on average, at the firm level.

Common model¹⁵

In economics the so called “production function framework” is the most common approach used whether the perspective is micro (firms), or macro (countries). Output, Y , is related to the *stock* of internal design knowledge capital (K), other internal knowledge capital (K^o) like R&D and skills, real capital (C) and labour (L).¹⁶ Other inputs like energy and materials can be included if the output is gross production while if excluded the output

¹⁵ Note this model is restricted in by assumptions but still can act as a summation device estimating the average return to design and being a tool to estimates its contribution to the GDP. For quantitative models implying more realism the Schumpeterian growth model of Aghion and Howitt (2004) is an interesting perspective to put design into.

¹⁶ See Hall et al (2010), for a more general description. In the present treatment we exclude the of impact of external knowledge stock

needs to be in value added terms.¹⁷ The factor A is the conventional representation of technical progress. If in productivity (labour) mode Y/L , the expression to the right is further reduced to intensities in labour. As this is a statistical model measured with imperfection a disturbance term e^{μ} is always included and the successful statistical estimation of the parameters $\alpha, \beta, \gamma, \varphi$ hinges on the (assumed) properties of this.¹⁸

$$1) Y = AL^{\alpha}C^{\beta}[K]^{\gamma}[K^{\varphi}]^{\varphi}e^{\mu}$$

In order to simplify things the multiplicative model in (1) is in general estimated in logarithms. The expression (1) is thus converted into a linear form and the parameters of interest turns into proportional coefficients interpreted as elasticities i.e. the relative effect in per cent on output a 1 per cent increase in K might have.¹⁹

$$2) y_{it} = \eta_i + \lambda_t + \alpha l_{it} + \beta c_{it} + \gamma k_{it} + \varphi k_{it}^{\varphi} + \mu_{it}$$

An assumption is made that technical progress denoted as A in (1) have a natural logarithm in $\eta_i + \lambda_t$ the intercept in the statistical relationship. The new subscripts denote t for time and i for the individual firm or sector.

Box 1 Capital stocks

The difference between an expenditure input and an investment input is that expenditures are treated as consumed in the production process. Electric energy for machines is consumed instantaneously and is thus an expenditure; the cost of energy is merely forwarded to the price. Inputs like real capital, machines etc. can be used for a longer time than an instant. Conventionally items used in production with a longer economic lifespan than one year can in principle be treated as an investment good. There are two different kinds of investment good, the ones legitimate for inclusion in the balance sheet and the ones that are not. The former require strict ownership identification. Machines and real estate are considered as real assets, while patents, trademarks, registered designs and even good-will are treated as intangible assets.

The market value of an asset is defined as the value of the capital services the asset can supply for the rest of its 'life'. The market value thus depends on three items. The income (rental) of the capital service for the current year and future income streams which are in turn determined by the life length of the asset and finally the discount rate (long term bond interest).

The life-length of an asset has a certain 'age-efficiency' profile which can be different for different assets. A light bulb for instance works with full efficiency until its failure while other devices experience slightly less efficiency paralleled with the wear and tear. In general bell-shaped functions are used as a simplification. Linear depreciation is considered unrealistic. In the estimation of returns to real capital economists seldom relies on the enterprise's own valuation of their stocks of assets as this often is subject to different valuation schemes and tax planning considerations. Economists instead prefer 'gross investment' over time in order to calculate the stocks using the perpetual inventory method.

Here we note that in order for external outlays on design these must be considered as investments in order to be included in a value added model.

More details are given in:

Measuring Capital OECD Manual OECD (2001)

¹⁷ Note: Value Added is defined as revenue less outside purchases here and is thus not the equivalent of similar named Economic Value Added (EVA) which is something completely different.

¹⁸ For an example of an alternative approach see Bascavusoglu-Moreau & Tether (2011)

¹⁹ Proportional coefficients in this setting do not contradict the experience that for particular industries and particular enterprise the influence of a specific factor of production is much larger than the estimated proportional parameter. Statistics on returns of investments most often has characterized by skewed distributions and high kurtosis which is driven by a few influential observations.



Expression (1) relates stocks to the level of output. In statistical inquiries the common procedure is to ask for expenditures and not the accumulated stock of the factor in question. Expenditures (or rather investments when we talk about assets that cannot be considered as consumed instantaneously,) can be depicted with some further elaborations of (2). Differencing (2) with respect to time generates a growth perspective:

$$3) \Delta y_{it} = \Delta \lambda_t + \alpha \Delta l_{it} + \beta \Delta c_{it} + \gamma \Delta k_{it} + \varphi \Delta k_{it}^2 + \Delta u_{it}$$

Changes in the assets, which in principle earn a return, are now interpreted as investments.²⁰ Expression (3) might suffice, if data are available, for estimating a correlation between expenditures on design and the growth in value added. Hall et al (2010) however makes a further elaboration in order to measure the return net of depreciation i.e. part of the investments is needed for rebuilding the “scrapped” stock for which we interpret that design investment has a life length.²¹ To adjust for a depreciation of the “design stock” they rewrite (3)

$$4) \Delta y_{it} = \Delta \lambda_t + \alpha \Delta l_{it} + \beta \Delta c_{it} + \rho \frac{(R_{it} - \delta K_{it})}{Y_{it}} + \varphi \Delta k_{it}^2 + \Delta u_{it}$$

Where R is the gross investment in design in a given year and δ is the depreciation rate and ρ is the marginal productivity of design which according to Hall et al can be interpreted as the internal rate of return.²² (Note that other parameters are still estimated as elasticities). Thus estimating ρ whilst holding other knowledge inputs constant seem to suggest a way forward. Unfortunately such estimates for R&D expenditures have proven to be less stable across units (firms) than elasticity estimates, γ in expression (2) and (3). In more plain English the return of design can be estimated by the means of conventional economic models when information on annual expenditure on design and of the “stock of design” is available.

Accumulated design

The stock of design or δK_{it} (δ is not estimated in the expression) in 4) demands some further explanation. Building on the analogy of capital investment previous investments build up a capital stock as the capital is not consumed like fuel. The capital stock in a given time compared to new capital has two characteristics. One is that wear and tear make the old capital less productive thus decrease in value (capital loss). The second is that new capital by itself can contain attributes which decreases the old capital (depreciation). An example of the first characteristic is the price difference between a new Iphone 3 compared to a used Iphone 3 or the wear and tear aspect. The second is the difference between a new

²⁰ In the business jargon ROI or return on investment focus on assets from an investor perspective and not a production perspective. As assets in this nomenclature are securities and the investor invests in security A with a higher (expected) ROI than security B. In our perspective assets are different factors of production earning rents (thus not labour). The managers invest decision is invest in a new machine or invest in more design. In order to estimate this one needs to model jointly the marginal productivity of each factor.

²¹ The NESTA survey included such a question to respondents which resulted in a life length estimate of 4 years for design see Annex 2 below.

²² Follows from the definition of elasticity as the product between the derivative of Y w r t design and the ration K/Y . $R = K + \delta K t - I$.

Iphone 4 and a *new* Iphone3 or the innovation aspect. The challenge is to estimate the design capital of Iphone 3 and compare this with the design capital of Iphone 4.

Capital can have different patterns of depreciation (or age-efficiency patterns). For example a bridge is used until it must be closed or so called one hoss shay depreciation, while a truck needs a more continuously maintenance to deliver its utility (geometric depreciation is often applied to vehicle meaning an initial large depreciation in the beginning and less rate of depreciation after this).

What kind of depreciation patterns does design have? Design or results of design activities is in principle a kind of knowledge and thus not susceptible to be worn out. Still design can be said to be discarded from the market because other design is introduced into the market. Thus forces that affects the obsolescence and thus profitability of a design or the results of design activities is important to measure. The degree and pattern of this replacement is at present an area of research and the parameter δ in the expression above simply acknowledge that design has a certain depreciation pattern. Whether not better alternatives emerge design will be assumed to have a geometric pattern of depreciation. In short as long as the δ can be assumed to be above zero the neglect of previous design activities will lead to an error (underestimate) in the estimation of the return of design expenditures.²³

Empirical estimation of the contribution of knowledge inputs

Acquiring statistical estimates for the parameters of interest in the expression demands data on expenditures on design and other knowledge inputs for enterprises and their depreciation profiles over time something which is general not available. In order to estimate the contribution we have to switch to a cross-sectional perspective and substitute the lack of information with assumptions.

The outcome variable

From surveys like the CIS, more usable information is available. Still there are problems. First, as cited above in order to simplify the equation data on value added is required. But CIS only supplies data on outcome in the form of turnover for the same year as expenditures. To derive value added, further information gross profits and total costs of labour inputs are required. There are experiences (Griliches & Mairesse 1984) that have noted a significantly positive bias when using sales as dependent variable when intermediates are excluded. However, Hall et al (2010) refers to other studies that estimates returns on R&D using value added respectively sales (without information on intermediate inputs) using data from French manufacturing firms, the estimated elasticities do not differ “by much”.

Other outcome variables like the Tobin Q (market value in relation to booked value or replacement value) needs more qualified information. In principle only listed enterprises can supply market values which limit the applicability of using market values as an instrument in measuring the value of design.

CIS also collects data on an outcome variable innovative sales share. This is defined as the share of turnover for a given year from innovations introduced in the most recent 3 years. Unfortunately expenditures for this time-period is not given which means that relating

²³ See Galindo-Rueda et al p40ff for an more elaborate and formal discussion how to formulate depreciation in design

present expenditures on CIS innovation-outcome variable creates a reverse causation from previous innovation to present expenditures

Input measurements

In order to have correct estimation one needs to measure inputs and output in a consistent way. Hall et al (2010) discusses three issues that are particularly relevant. Note that we reiterate their discussion here which focuses on R&D but we believe that substituting R&D with design does not change the sense of their argument. The three issues are:

- Double-counting and expensing bias
- Sensitivity to correction of the quality of labour and capital
- Sensitivity with respect to variations in capital utilization

Design activities like R&D is composed of both labour and capital and thus implies material costs as well as human capital, it is likely that these costs will be included both in the particular costs for design (R&D) as well as in the total costs for L and K in the expressions above.

Secondly experiences referred to by Hall et al (2010) shows that when labour is categorised in qualifications the estimate on R&D decreases probably because there are complementarities between highly qualified employees and R&D. This is probably to be expected w r t design.

Finally, in the case of time series data, firm specific statics are excluded when differencing (expressions 3 & 4) but other cyclical noise seem to make things worse.

Other problems

A correct statistical estimation is thus not a simple task. Several systematic mis-measurements (biases) can be identified depending on the supply and quality of data.

Simultaneous bias

This leads to the discussion of problems of causality in cross-sectional surveys. Do large expenditures on design activities drive large sales or is it the other way around? Do large sales give enterprises the opportunity to invest more in R&D and in design activities?

In principle it is not possible to solve the causality problem with cross-sectional data when inputs and outputs are measured at the same year.

The correlation between design and the outcome variable can however be estimated with higher validity if the probability of engaging in design activity is estimated simultaneously with a model for determining the level of expenditures on design and the estimation of the correlation between design and outcome (sales).²⁴

2.1.1 Self-selection bias

A second and connected bias can in principle be identified whether the return on design expenditures it is estimated on all enterprises or only on those who have positive expenditures or have self-selected themselves into design activities. Correct estimates

²⁴ *The CIS survey measure inputs costs for the same year as for sales. However CIS have indicators whether the firm were engaged in an innovative activity in a specific time frame before the year of expenditure measurement.*

depends on the question at hand i.e. the return given one has invested in design or the average return for the whole population of enterprises, the latter estimation should be adjusted by the probability having expenditures in design activities. In this case this will be the same solution required as for the bias identified in 2.2.1²⁵

Omitted variable bias

In the estimation of the return on design expenditures it is also important to consider omitted variable bias. If for example other input factors have a positive correlation with design expenditures like for example R&D expenditures, the omission of which will lead to a positive biased estimate of the return to design. In the case of estimation via an innovation survey like the CIS other innovative input activities can be controlled for. But if the enlarged harmonized design survey is to be used for the estimation of returns it is important to measure also other innovative inputs in this and not solely design.

The same argument applies to the estimation of returns on other innovative inputs. The returns to R&D reported by Hall et al (2010) are most likely overstated as design activities or other innovative activities is not included in the estimations. Note that this applies also to different kind of simplistic bivariate correlations where only one asset and sales/valued for enterprises are presented.²⁶

Extreme values influence

The fourth type of bias is more of a sensitivity issue regarding the empirical distribution of the sample on which estimation is made. If the distribution of the indicator of outcome is characterized by extreme outliers this will influence the estimate if the chosen method of estimation rely on squared deviations from the mean, as in OLS. In principle the logarithmic transformation will work as a variance reduction mechanism but robust methods of estimation show lower rates on the return on R&D (Hall et al 2010 p 20).

It is reasonable to believe that design will have similar dynamics as R&D with respect to ex ante expectations on return which will have a much smoother distribution compared to the ex post realisations which will exhibit skewed distributions with fat tails or in other words some products/services will be much more popular than expected generating bandwagon effects.

Assumptions

The linear expression (2) and (3) above builds on several behavioural assumptions which need to be acknowledged.

The lack of causality in cross-sectional surveys (like CIS) requires an assumption of “representative firm” which is to say that given a correct model the enterprises in the sample illustrates one firm in different settings: big, small, with/without design activities etc.

Management issues, something underlined in business economics since long has now found its way also in quantitative modelling. Given a specific “volume”, how a certain factor is utilized might thus be different in different enterprises and thus with a different output and outcome (more on this in section on Process below).

²⁵ See e.g. discussion in Duguet, Crepon and Mairesse (1998)

²⁶ The Danish study(2003) is an example of such kind of bivariate relationship without noting other factors influencing the dynamics.

Above it was mentioned that the standard model focus on explaining the variation of volumes or levels in an output measure by the means of different input factors of production like labour, capital, energy and R&D. In the perspective of innovation where both R&D and other innovative activities like design are utilized in order to create new products (services) and improve production processes. Thus in recent research one first model factors influencing the innovation output and in a second stage the innovative output is related to business performance.

The short-comings of the above model stems primarily from the assumption of competitive markets which removes heterogeneity among enterprises for example differences in absorptive capacity in the enterprises. This can be dealt with in principle by measuring two aspects of the conduct of the enterprise. One is the incidence of different cooperation arrangements (which are covered in the CIS) and similar types of linkages between the enterprise and knowledge sources external to the enterprise. Whether design demands specific such measurement is a matter of future research (see Annex 2 below).

The measuring of the competitive position of the enterprise is partly dealt with in the CIS at the present by the means of measuring different objectives for product and process innovation and the character of the offerings made by the enterprise with respect to price and quality in comparison to its rivals. From €design perspective such measurements will still be of interest and Tables below gives example on this.²⁷

Table 10 Competitive position of the enterprise, alternative 2

Which of the following is most important for the competitiveness of your products? (goods and/or services)

Low cost	<input type="checkbox"/>
Performance and functionality	<input type="checkbox"/>
User experience: appearance, packaging, branding	<input type="checkbox"/>
BOTH Performance and functionality AND User experience: appearance, packaging, branding	<input type="checkbox"/>

Table 11 Competitive position of the enterprise, alternative 2

Which of the following is most important for the competitiveness of your products? (goods and/or services)
Apportion 100 points between the following 4 categories ... (e.g. if they are all equally important, then score each of them 25 points. If only cost is important then score it 100 points)

Low cost	
Performance and functionality	
User experience: appearance, packaging, branding	
BOTH Performance and functionality AND User experience: appearance, packaging, branding	
TOTAL	100

²⁷ The perspective of Aghion & Howitt (2006) uses the description of innovation as “escaping competition” and “schumpeterian effect” when characterising the competitive situation a specific enterprise found itself.

The contribution of Design to GDP

The €design project has the aim to formulate how the contribution of design to GDP can be evaluated. This section summarizes main components in the national accounts and the information need to evaluate the contribution of a part of the system.

The evaluation of countries Gross domestic product (GDP) is regulated in European Union through the act 2223/96 which mandates that member countries should implement national account according to the ESA 95.²⁸ GDP is evaluated either from the production side and the consumption side. Production consists of the sum of value added in the production of goods and services and includes items exported. The consumption part consists of private and public consumption and the sum of investments and imports. According to the National accounts framework these two measures need to be balanced.

To evaluate a part of the production system which is not detailed in the standard regulation, a so called satellite account can be defined. For example a satellite account for tourism is evaluated according to a common definition on tourism. At present, satellite account is also under way for R&D and in some countries the GDP part of Health is evaluated as well. Finland and Spain have evaluated satellite accounts in order to measure the contribution from the cultural sector. To measure a specific sector to GDP-level is a common experience and in general the problem lies primarily in the quality and generality of data. In principle data collected in an effort to estimate the return of a design investment can be utilized for estimating design contribution to GDP. In this case the measurement starts from enterprise data and thus the macro figure stems from the productions side. All entities in the data collection need to represent a certain number of real enterprises by suitable weighing. Information on design at the micro level can thus be aggregated to the macro level, assuming one can identify the part of design, by assumption or measured, which contribute to the valued-added. That is, design services which can be identified as immediate consumption should be excluded.

However other methods are available for estimating the contribution of design to GDP. In the discussion paper *How much does the UK employ, spend and invest in design?* Galindo-Rueda et al use labour market statistics for the design professionals and estimates annual design expenditures in UK to £17bn far more than other estimates. See Annex 5.²⁹

²⁸ http://europa.eu/legislation_summaries/budget/134005_en.htm

²⁹ Galindo-Rueda et al (2010)

Annex 2: Previous experiences of measuring design

WP1 surveyed different proposed definitions of design and concluded that design can be viewed as a set of activities characterized by a simultaneous consideration of both functional and form/aesthetical aspects when creating value out of the production of goods or services. As WP1 formulated:

To design is to integrate functional, emotional and social utilities

(€design July 2012 p X)

In this section we present a summary of how design has been treated in previous surveys where the measurement of design has been either the main focus or an item aside by other activities. Besides the presentation of design this chapter also presents experiences regarding how to measure management practises (process) and examples of what kind of output/outcomes that has been found relevant to measure.

In chapter 4, examples of how measurement of design can be included in the CIS survey in a more efficient way together with suggestion on the outline of a larger design focused survey.

The impression of design in surveys

Table 1 lists a sample of surveys which have measured design at the enterprise level explicitly.³⁰ The sample is restricted to design surveys in UK, France Denmark, Austria and Sweden. Other surveys listed besides CIS is the Survey on business expenditures on intangible assets.

Denmark, Austria and Sweden are similar types of surveys aiming at measuring how and how much enterprise on the average works with design. All definitions have words which relate to design as relevant in all stages of production both in the initial development stages as well as in marketing. The Swedish presentation is perhaps a little more explicit with respect to design as a device for communication. The Austrian presentation includes the word “user-friendliness” but none of these presentations sufficiently meet the entirety of WP1 definition.

The French design survey has taken another route. Nowhere in their questionnaire or report is there a referral to what “design” can be understood instead one refers to amount of design professionals thus design is what design professionals do. The French survey also, as other design surveys, measure the design activity in different areas as the usage of design in the creation of new products/services, the use of design in packaging, the use of design in sales etc.

A third more elaborated alternative is the way Livesey & Moultrie apply in an effort to measure design spending in the UK. Design is described as having four dimensions. First the *technical aspect of design* when design includes engineering skills often related to the design of production processes and technologies to deliver services (p 12).

³⁰ The amount of design in the economy can be estimated in other ways see Annex 5

Table 12 Design formulation in different surveys³¹

Country	Survey	Formulation
DK	Design survey 2003 ³²	"When we speak of design we mean design strategies, development and styling – everything that takes place prior to production of implementation of products (printed matter, sales fair stalls, web sites, interiors, etc.)." p6
DK	CIS 2010	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. Development of new goods and services, new areas of business activity and organisation, brands
Sweden	Design survey 2008 ³³	Design implies a professional end creative work in which functional and aesthetical demands are of critical importance. The need for design emanates from product development and market communication Industrial design service design and design management are all aspects of product development Market communication imply graphical design, interior design and exposure
Austria	Departure, Microgigant & IFES ³⁴	By design, we mean the entire process that gives products or services a certain form and function -ranging from cars to paper clips to cell phones, from clothes to chocolate, from websites to financial services. To make products function in the desired manner, various design requirements must be considered, i.e. aesthetical, functional, user-friendliness, product comfort.
France	2005 ³⁵	No definition implicit design is what designers do
UK	2008 ³⁶	<p>The diagram for the UK 2008 survey is structured as follows:</p> <ul style="list-style-type: none"> Left Column (Contexts): <ul style="list-style-type: none"> Design in the creation of products and services Design in the communication, promotion and delivery of products and services or the overall business Right Column (Design Aspects): <ul style="list-style-type: none"> Design relating to the technical/engineering aspects of creating products and services Design of the user experience in the creation of products and services Design as part of promotion, communication, branding and distribution of products and services Design as part of developing promoting, and communication the corporate identity Vertical Groupings: <ul style="list-style-type: none"> Technical design: Indicated by a double-headed vertical arrow connecting the top two design aspects. Non-technical design: Indicated by a double-headed vertical arrow connecting the bottom two design aspects. Flow Indicators: Curved arrows point from the contexts to the corresponding design aspects.

³¹ The table is limited to actual measurements, however OECD has also recently surveyed experiences in design measurements see "Measuring design and its role in innovation" DSTI/EAS/STP/NESTI(2013)7

³² http://www.ebst.dk/file/1924/the_economic_effects_of_design.pdf

³³ http://www.svid.se/upload/For_foretag/Undersokningar/Svenska_foretag_om_design_2008.pdf (in Swedish unfortunately)

³⁴ http://www.departure.at/jart/prj3/departure_web/data/uploads/website_downloads/2011/Netzwerkaktivitaeten/Study_Design_Ladder.pdf?dlink-ran=1339684669682,

³⁵ <http://www.industrie.gouv.fr/biblioth/docu/dossiers/sect/pdf/rapdesign.pdf>. Note that the actual survey was made for the conditions year 2000

³⁶ Livesey & Moultrie (2008) http://www.ifm.eng.cam.ac.uk/dmg/documents/090406company_design_spend.pdf

UK	NESTA ³⁷	The design of products or services to improve their look or performance, web designs etc. Exclude design of scientific prototypes (part of R&D) and design of software
CIS		Activities to design, improve or change the shape or appearance of new or significantly improved goods or services

User-focused design is a second dimension and is described as the functions of product aesthetics, ergonomics, interfaces and the experience with the overall service.

Two dimensions are related to the communications to the market. One is *identity design* which deals with features to increase the perception of the personality of the enterprise trademarks. The other promotional design concerns the particularity of packaging, presentation and display of enterprise products and services.

As for surveys where design is a component among others design is of course more restricted. In the survey of intangible assets produced by NESTA in 2009 the respondents are simply asked to supply figures on:

The design of products or services to improve their look or performance, web designs etc.

While in the harmonized Community Innovations Survey (CIS) enterprises are tick a yes or no whether specific innovative activities has been pursued in recent years, design is here described as:

		Yes	No
Design	Activities to design, improve or change the shape or appearance of new or significantly improved goods or services	<input type="checkbox"/>	<input type="checkbox"/>

Innovation surveys in fact differ a little between countries and the UK survey is an example where design is treated differently. In the UK design is described as:

All forms of Design

Engagement in design activities for the development or implementation of new or improved goods, services and processes. Design activities in the R&D phase of product development should be excluded

The UK survey acknowledge thus what WP1 noted that parts of R&D contain design and need to be explicitly handled, which the harmonized CIS and NESTA survey neglects.

In general all surveys try to formulate design in a more “lay vocabulary” than the theoretical formulation put forward by WP1. No survey has included concepts referring to the social and emotional dimension at the user level.

In the report from WP1 it was concluded that the design concept is divided and impartially treated in the OECD manuals. Parts of design activities can be considered as R&D others as innovative activity with respect to product and process development and finally parts is identified as activities related to marketing and branding. No definitions except the UK CIS have explicitly referred that design could have R&D parts which are to be excluded. The design surveys covered in this report have listed certain areas where design-activities can be contained but R&D as activity never explicitly mentioned, instead the formulation the incidence of “design as a component of product development” or “stage of idea generation”.

³⁷ The questionnaire is found at the ONS website “Survey of business expenditure on intangible assets” <http://www.esds.ac.uk/findingData/snDescription.asp?sn=6701&print=1>

The decomposition of design as technical and non-technical in Livesey & Moultrie is perhaps a way to move forward. WP1 use the concept functional which has technical connotations. Non-technical might thus be interpreted as addressing among other thing the social and emotional user considerations with new product development.

From a measurement perspective the sensitivity of how to describe design are perhaps more important the less focus measurement is on design.

Input measurement

In this section we review how design as an input has been measured given an explicit or an implicit definition of design. The surveys covered in table 1 make use of a limited number of different measures.

1. Cost of design either in absolute numbers or in ranges, where costs are asked for different areas where design is relevant (creation of product, packaging, branding)
2. Whether and how much design procured externally which is a part of the above item.
3. Number of employees which
 - a. Works entirely with design
 - b. Works partly with design
 - c. Have a superior design education

From the perspective to estimate the return of design the full costs of design activities is in line with similar costs/investments for other inputs which are needed to consider in the process of estimation.

In general when surveys ask for expenditures they start to ask whether the enterprise actually is engaged in a certain activity, like design, as a precursor to a question on “how much”.

CIS

The harmonized CIS (HCIS) measure the presence of the innovative activity design as stated above:³⁸

Market introductions of innovations:
 Activities for the market introduction of your new or significantly improved goods or services, including market research and launch advertising
 Design:
 Activities to design, improve or change the shape or appearance of new or significantly improved goods or services

The UK version of CIS formulates the question as:

All forms of design:
 Engagement in design activities for the development or implementation of new or improved goods, services and processes. Design activities in the R&D phase of product development should be excluded
 Market introductions of innovations

³⁸ The HCIS refers to the version of CIS Eurostat distribute see Annex 6

Changes to product or service design
 Market research
 Changes to marketing methods
 Launch advertising

The inclusion of market introduction of innovations above has been included because parts of design costs are related to the communication to the market. The next question in these surveys asked for the size of expenditure. As for the HCIS the question is:

In 2012, how much did your enterprise spend on the following activities, as defined in question 5.1 above? Then, please estimate the share of expenditures for each activity that was for product or process innovation? as defined in question 5.1 above.

While in the UK CIS the analogue question is formulated as:

For each of the main innovation related activities in question 4, please ESTIMATE the amount of expenditure for the year 2008

All forms of design	(in thousands of GBP)
Market introductions	(in thousands of GBP)

Design also emerges in another section in the HCIS marketing innovations which we describe in the next section on output/outcomes.

Danish CIS 2010 design and experiential addendum³⁹

In the 2010 Research and Innovation survey in Denmark there was a voluntarily addendum on design. Design was defined 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. Development of new goods and services, new areas of business activity and organisation, brands

In the addendum one asked the enterprises to describe the general character of the use of design as:⁴⁰

1. No systematic work with design
2. Design is used as a styling of in the finishing of a product
3. Design is integrated but not a governing element in enterprise development work
4. Design is a central and governing element in the enterprise
5. Not relevant

Furthermore the enterprises were asked to answer with a yes/no whether below descriptions was applicable on their work with design:

1. Design as a way to solve problems in product development issues
2. Designers has been included in product development teams
3. The enterprise as a formulated design policy connecting products, offerings, brands and marketing

³⁹ Source Danmark Statistik

⁴⁰ See section below on process and design ladder.

4. The enterprise has a design policy for the development of new products, offerings, concepts and brands
5. Designers has participated in the definition of new enterprise activities

The addendum also asked enterprises regarding how they worked with adding experiential value to their products and services where design is used as one source of such value (yes/no).

The Danish addendum did not ask for specific expenditures regarding design and experiential values.

UK Intangible asset survey - inputs

The survey of business expenditures on intangible assets have in all four questions regarding design. First one asks:

During the reporting period, did your business fund any external or internal design?

The design of products or services to improve their look or performance, web designs etc.
Exclude design of scientific prototypes (part of R&D) and design of software

If the enterprise answers with a yes three more questions are put forward:

During the reporting period, what was your business's expenditure on design activities by other organisations?

Include costs of bought-in design services. Exclude costs of design embedded in other items of current or capital expenditure

The answer should be given in thousands of GBP.

During the reporting period, what was your business's expenditure on design work carried out by its own staff?

Include:

- Staff costs of all staff involved, e.g. graphic designers, product designers, architects, design engineers, etc.
- Associated costs, including office facilities, overheads and materials but not capital costs.

Note: Estimates based on proportions of staff time are acceptable

The answer should be given in thousands of GBP.

Explicit design surveys - inputs

These survey exhibits variants of ways to measure design activity. The ones surveyed here with an explicit treatment of expenditures on design is France and the Livesey & Moultrie study on UK companies, while the surveys in Denmark, Sweden and Austria counts number of staff which are design professionals and/or work with design where expenditures derived from statistics on salaries.

French survey

The French survey asks enterprises to put in their expenditures on design (vos dépenses annuelles de design) in three intervals for each area of tasks: Design in products, Design in packaging, graphical design and interior design (d'architecture d'intérieur)

Less than 150 KF*

Between 150 KF and 300 KF

More than 300 KF

* KF=thousands Franc as the survey was collecting data before the Euro.

The survey also asked for whether the expenses recent years in the task areas had been

Increased (en hausse)

Stable

Decreased (en baisse)

The French study measures the frequency of use of external design services but do not measure the expenditures on this.

Livesey & Moultrie survey⁴¹

Livesey & Moultrie (2008) (LM) aimed to measure the spending on design among UK enterprises with a survey of 358 UK enterprises. The estimate spending in the four dimensions as exhibited in table 1. After introducing the design concept and its parts the respondents were asked to file the respective expenditures for each category. Each answer were asked also to be qualified in the level of precision

Estimate of design spend	Precision of estimate (please tick as appropriate to indicate the relative precision of your estimate)				
	Within £1K	£10K	£50K	£100K	can't estimate
In House					
Outsourced					

In LM measure of design the technical design measurement includes R&D components can be considered as design. In the UK CIS should these item should be excluded.

Sweden, Denmark and Austria

These surveys do not estimate the spending directly instead as noted above one measures the number of design workers in the staff. In all surveys one has a special interest in how many there are in the staff with a superior design education. In Austria one also measure whether staff works partly or entirely with design issues.

The Swedish survey has an intricate measuring external design services. For each area of design service, product development and communication, one asks for the proportion between internal and external services. Thus the measurement of total spending must rely on the number of staff and the associated salary of these which is enhanced by a proportion to include a measure of the external spending.

These surveys have had a focus on the use of the design in other respect than the amount in absolute numbers. Especially the Swedish survey has included different indicators on how enterprises work with design which is the topic of section 3.4 and intermediate results of design which is the topic of next section.

⁴¹ In this chapter we only relate how measures have been constructed. For empirical result see chapter 5

Output/Outcome measurement

In this section we survey other output/outcome indicators than value added and sales which was treated in the estimation of the return of an asset.

CIS – outcomes

Innovation

The CIS main objective is to measure the incidence of innovation which is alleged to be closely associated with the growth of productivity. Thus from a design perspective it is fundamental to relate design to the introduction of innovations as an intermediate output for its contribution to productivity. The main mechanism for this is the above described design related innovative activities and their relation to an innovative output.

The HCIS includes also another intermediate result which can be claimed as a result of design activity namely question 10.1:

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 enterprise introduce	Yes	No
Significant changes to the aesthetic design or packaging of a good or service (<i>exclude changes that alter the product's functional or user characteristics – these are product innovations</i>)	<input type="checkbox"/>	<input type="checkbox"/>

In section 10.2 the amount of marketing innovation is related to the following “outputs”/objectives of activities:

10.2 How important were each of the following objectives for your enterprise's marketing innovations introduced during the three years 2010 to 2012 inclusive?

If your enterprise introduced several marketing innovations, make an overall evaluation

	High	Medium	Low	Not relevant
Increase or maintain market share	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Introduce products to new customer groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Introduce products to new geographic markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note however that these questions relates to the previous three year period which is preceding the investment measured in the expenditures question.

The UK CIS do not have a similar section on market innovations as the HCIS but instead the UK CIS has the intermediate result

During the 5 year period xxx to yyy did your enterprise
 Register an industrial design (Y/N)
 Register a trademark. (Y/N)

The problem with this intermediate result is that the measured expenditures lie in the end of the time interval which again reverses the causal relationship between the intensity of an activity and the measured intermediate result.

In a future CIS a new module on other outcomes related to the growth of turnover are suggested, see table below. In principle the innovative activities can all be considered as means to achieve better economic results.

Q11.1 How important was each of the following factors for increasing or maintaining the turnover of your enterprise in the past three years?

	High	Degree of Importance		Not relevant
		Medium	Low	
Reducing in-house costs of operation or production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduce costs of mat. or service inputs through outsource/ finding cheap input sources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New or significantly improved goods or services introd between 2010 and 2012	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New or significantly improved goods or services introduced prior to 2010	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improving the quality of existing goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Offering a broad range of goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intensified or improved marketing of goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Responding rapidly to demand needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Acquisition of other businesses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

UK Intangible asset survey - outcomes

The only measure UK intangible asset survey measure is the time the enterprise expects a return to the investment.

How long would your business expect to benefit from a typical expenditure on design?

The answer could be given in years and/or months

Outcomes in the French design survey

While previous CIS and still the current UK CIS have included the frequency of registered designs none of the design surveys has included this measure of output. However like the later NESTA survey on intangibles the French survey asked for the life length of the investment in design in the task areas specified (le retour sur investissement de vos dépenses de design):

- Less than a year
- Between 1 and 2 years
- More than 2 years

The French study thus preceded the NESTA survey in measuring this kind of outcome.

No other kind of outcomes is measured in this survey which is focused on the usage of design (etudes de pratiques du design en pmi).

Outcome measures in the Swedish design survey 2008

In the Swedish survey there is a section on the significance of design activities which asks form crude estimates of the impression of design influence in certain business figures.

Estimate the contribution from design activities during the recent 12 months?

Q16	Not at all	To some degree	Sizable	To very high degree	Do not know
Presence at new markets					
Increased market shares					
Nye products or services					
Increased competitiveness					
More employees					

Increased turnover					
Increased profitability					

Source: Svenska företag om design 2008

If the previous question measured the presence of a contribution a following question asked about the strength in this contribution. The strength was measured by the means of ranking the degree of value added.

What value does design add to your enterprise among the following factors? Rank from 1 to 7, where 1 means of no value and 7 means of high value.

Q19	RANK	Don't know
Increase turnover		
Decrease costs		
Build stronger brand		
Improve user utility		
Improve communications		
Implement modes of thinking among staff		

Source: Svenska företag om design 2008

A further indicator, albeit not an output indicator, of the relevance of design taken from the Swedish survey is whether the enterprise perceive a general change in the demand or requirement of design with respect to the enterprise offerings.

Have the requirements on working with design changed for your enterprise recent years?

Q18	Increased	Unchanged	Decreased	Don't know
Requirements on design for product development have...				
Requirements on design for communication have...				
Requirements on design for sustainable development				

Source: Svenska företag om design 2008

Linkages and cooperation with respect to design

The Oslo manual discusses the importance of knowledge flows to innovation. Knowledge flows or enterprise linkages with external sources of knowledge can take different forms. The Oslo manual digresses on three forms of particular importance (OECD 2005 chap 5).

Open innovation source, *openly available information that does not require the purchase of technology or intellectual property rights, or interaction with the source.*

The acquisition of knowledge and technology, *purchases of external knowledge and/or knowledge and technology embodied in capital goods (machinery, equipment, software) and services, which do not involve interaction with the source.*

The formal cooperation in innovation projects with external partners, *active co-operation with other enterprises or public research institutions for innovation activities (which may include purchases of knowledge and technology).*

In the sections above we have only treated the acquisitions of knowledge with respect to expenditures for external design services. The aspect of other knowledge flows which the Oslo manual notes are with the exception for CIS not treated at all in the surveyed investigations.

As for the CIS this includes one section on information flows important for the completion of innovation projects and one section on formal co-operation with partners external to the enterprise. In both these sections the option for answers include clients and customers i.e. the user perspective which is of importance for design. Whether design needs even more attention than what is supplied by the present CIS is a matter of empirical evidence.

Process measurement

In economic research one has started to acknowledge experience made in the business administration research. “How” a firm actually implements an investment of a given size matters.⁴²

In an effort to measure this with respect to design Denmark in its survey used the concept *design ladder*. The design ladder in Denmark consisted of 4 steps:⁴³

1 No design: Design is an inconspicuous part of product development. Performed by non-professionals

2 Design as styling: Design is perceived as a final aesthetic finish of a product. Occasionally design professionals are involved

3 Design as process: Design is not a finite part of a process but a work method adopted very early in product development. The design solution is adapted to the task and focused on the end-user and requires a multidisciplinary approach e.g. involving process technicians, material technologists, marketing and organisational people.

4 Design as innovation: The designer collaborates with the owner/management in adopting an innovative approach to all – or substantial parts – of the business foundation. The design process combined with the company vision and future role in the value chain are important elements.

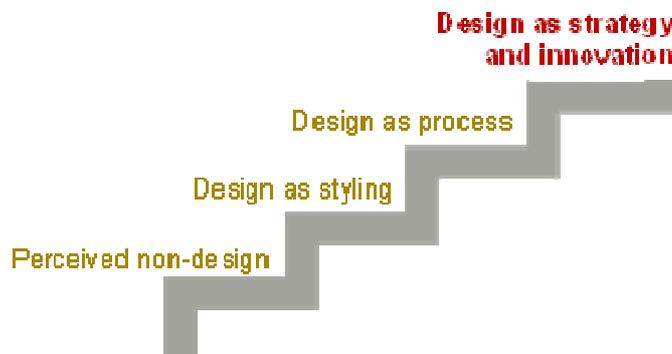
The design ladder builds on the assumption that an enterprise measured on a higher step of the ladder has implemented higher degree of sophistication of design management practises (figure 2). This in turn is conjectured to be correlated to positive business performance.⁴⁴

⁴² See Bloom N & van Reenen J (2007) for discussion and example of analysis on LEAN management

⁴³ See p 28 Denmark National Agency for Enterprise and Housing (2003)

⁴⁴ Bloom & van Reenen IBID derives empirical significance of management practices on value added, turnover, market value

Figure 1 Design ladder



In Sweden and in Austria one followed the example and included questions measuring the degree of inclusion of design in the enterprise management. Box 2 below

Box 2 Design ladder: Swedish example

In Sweden the latest design survey used three questions to position the enterprises in different "design maturity":

A: In which phase does design work start in your company? Imagine a value chain starting with the development of an idea and finishing with the launch of a new product or new service. Only one answer (Q14)

- A1 Do not use design at all
- A2 Design is used in the development of the original idea
- A3 Design is used in a survey of consumer attitude
- A4 Design is used in the product development
- A5 Design is used in the start of the production of the new product/service
- A6 Design is used in the on-going production of the new product/service
- A7 Design is used in the launch of the new product/service

B2: Which of these statements describes how your company applies the design? By design, we refer both to product development and communication with the market (Q2)

Only one answer

- B1 To us Design is more or less the external attribute or form of the product/service
- B2 We look at design as a natural part of the work process
- B3 We never talk about design in the company
- B4 We use design at the executive levels due to its strategic value

C3: Which of following propositions applies to your company? Design in this context can both be used in product development or in the communication with the market. (Q7)

Only one answer.

- C1 We cooperate continuously with our designers to develop the company strategy
- C2 The designer is included early in development processes
- C3 We do not have any relations to individuals or companies that work with design
- C4 We source design skills when needed

An index is calculated from a set of questions where higher value imply a more strategically/innovative use of design (figure 2).

The Design Ladder approach reviewed her has not made any reference to academic research or other theoretical reasoning. The latest application has been the Danish CIS

2010 which included questions similar to original ones. This created the opportunity to describe the enterprises innovation activities using the design ladder grid. As perhaps expected the more systematic use of design seems to be correlated with high activities in R&D. Also, the enterprises where design was an integrated part of activities were also correlated with innovative performance.⁴⁵

2.2 Discussion and suggestion for further work

Above we have surveyed the use of different definitions and measurement devices regarding design in a sample of surveys. In this last section we make some conclusions we find relevant to focus on with respect to the objectives of the €design project.

The characteristic of design as discussed in WP1 is that design involves activities which entail both staff costs and cost of purchases of other inputs like software and equipment. These design activities can be traced in several other business activities like R&D, marketing, sourced knowledge and investment in capital (software and equipment). The general problem of measuring design expenditures is in what degree one can measure this net of other components. While the UK CIS tries to measure the design expenditures net of R&D it is not clear if design related to marketing is contained in the design expenditures or in the marketing expenditures. The same applies for capital investments. In principle if the enterprise knows the budget for the design section they might put that figure for the design expenditures. As for the capital the enterprise look at changes in the balance sheet which ends in design equipment gets double counted. Double counting of design in R&D and capital is perhaps a minor issue in quantitative terms, but is an empirical issue to solve, perhaps with a few case studies.

In CIS there is an innovative activity label expenditure on external knowledge. In this procured design services should be included which is not clear. Evidence should be put forward that design need to be explicit as an item under this heading. An alternative is that design procured should be included in the design questions.

Of more importance is probably the dichotomy of design between product development aspects and communications aspects. This is also an empirical issue but there is evidence from the Swedish survey that the design staffs is roughly equally divided between the two.

2.2.1 Design description/definition in surveys

The definition of design put forward by the project says that design contributes in technical/functional aspects with user social and user emotional aspects. None in sample of surveys covered has a definition which contains its entirety albeit some define design as a tool booth to develop products/services as well as a tool for to develop forms of communication.

If one take as a departure the existing CIS the description of design should focus on a better design description and treatment in the innovative activities of marketing and design. The alternative route is to depart from the theoretical definition proposed in WP1 rephrase it according to the Livesey & Moultrie model, which might be problematic as this introduces different theoretical concepts.

⁴⁵ Dansk statistic <http://www.dst.dk/da/Statistik/Publikationer/VisPub.aspx?cid=15934>

2.2.2 Design as an input – measuring the input of design

Given the decision on what included in the design measure (or the sum of components of design measures) the direct measure of investments in design is an estimate of the absolute expenditure. That is the way UK CIS, Livesey & Moultrie and the NESTA survey measure design expenditures. Here it is important that expenditures do not only involve staff but also expenditures on material and design related capital if this is not included in the acquisition there off is measured elsewhere.

2.2.3 Suggestions w r t output/outcome

In chapter 2 the relevant output indicators for estimating the return of an asset like design are value added or if this is not at, hand turnover/sales. Here we conclude that other intermediate outputs or the measurement of influence of design in certain dimension of business has been put forward in the sample of experience surveyed in this report.

The main intermediate indicator is the incidence of innovation where design can be related to as an activity performed by the firm in the generation of the innovation.

However the limitation of material covered in this report is probably too little to make conclusion of other relevant intermediate outputs and outcomes. More research in this area is needed.

The fact that no design survey has measured the frequency of the intermediate output “registration of design” or trademarks or copyright, needs some kind of clarification from the €design project. If this output is of no relevance for design performance the evidence of this must be compiled.

2.2.4 Suggestions w r t knowledge flows and linkages

The CIS questionnaire includes linkages with a client and/or customer option. Other surveys do not include suggestions on how to measure these linkages. In future cognitive testing of questions regarding linkages and co-operations one might include a discussion on how large a part of these linkages design amounts to.

2.2.5 Suggestions w r t measurement of design management

In the WP2 tasks were not specified to suggest anything in this area. However according to the recent research which acknowledges that part of the variation in productivity can be explained by different degree of how an implementation is pursued or in other words the management of an asset. In conventional economic estimation practices this learning aspects of economy is excluded by assumptions of competitive markets.

WP2 sympathise with the “design ladder” approach but conclude that this needs to be placed in a better theory context. In the €design perspective it needs a re-conceptualisation to better address both product development and marketing. It also needs to be strengthened by further empirical evidence e.g. case studies which conclude in a suitable measurement tool for standardized surveys.

2.3 The improvement of measuring design activities; €design perspective

Previous section reviewed experiences of describing and measuring design. We concluded that none of the reviewed measurement tools covered sufficiently the definition of the €design:

To design is to integrate functional, emotional and social utilities

(€design July 2012 p X)

This chapter tries to formulate a measurement tool which encompasses the intention in the phrase above and which can give guidelines on how to measure what the definition looks for. Experiences made within the CIS testing of items in the questionnaire tells us that most problems deals with definitions that is descriptions what to include in the measurement and the degree of detail of the item asked for. For some items in the CIS questionnaire several person in the enterprise staff need to be engaged in order to supply with an adequate answer.

The concept of design has a problem that it has a quite restricted understanding among laymen meaning the shape and appearance of a product. Over time the design industry has widen this “lay” concept into something much broader which the theoretical concept put forward by the €design acknowledge.

The challenge is to put the €design concept into both a more lay terms and do that in a succinct way.

This formulation builds on two assumptions. First that design or design activity is to create something. Thus design activities have objectives which can be formulated as:

- Create goods
- Create services, processes
- Create environments
- Create messages
- Create experiences

Thus items are in principle measurable “containers” or objects of design.

The second assumption is that the correct fit of functional, emotional and social utilities can be considered as a result of design activities. This correct fit has two perspectives one consumer/user perspective (to satisfy needs) and second an enterprise perspective (to generate sales by acknowledging needs) where the latter is the one we focus here.⁴⁶

What is important here is that functional, emotional, and social values cannot be interpreted as distinct skills in which the enterprises use as input factors. Instead these values must be interpreted as a complex bundle perceived at the user level and registered by the enterprise indirectly.

These two assumptions are contained in a description of design antedating the theoretical definition above

To design is to create, improve and /or implement a good, a service, marketing or organisational method that balances perceived emotional, social and functional utilities.

(Barcelona working paper July 2011 p 4)

The conclusion of above can be summarized in what the measurement tool must handle:

⁴⁶ Note the user perspective with respect to correct fit is of course both relevant and important to follow up with studies.

1. The lay description of design activities. Here it is important to note activities not design simple which people might perceive as an object.
2. The measurement of peoples design activities
 - a. Here we merely reiterate the dimensions of number of personnel engaged in design activities, distribution of professional designers and others.
 - b. The distribution between enterprise internal activities and activities sourced

Two alternative routes can be taken in this measurement. The first more traditional measures activities by the “type” of design activity:

Type of activity	Do you do?	If Yes, how much`?
Graphic design	Y/N	
Product design	Y/N	
Marketing design	Y/N	
Brand design	Y/N	
etc.	Y/N	

The alternative routes use concept characterizing the production stages

Type of stage	Are design activities present in this stage of value creation?	If Yes, how much`?
Research	Y/N	
Product development	Y/N	
Product implementation/testing	Y/N	
Product launch to the market	Y/N	
etc.	Y/N	

3. The measurement of perceived design result at the enterprise level

A measurement of the “correct fit” can perhaps be made by the following approach.

Why do your customers buy your goods/services?

Customers have several reasons for buying a product. In this survey we differ between 1) functional characteristics or technical aspects of a product/service 2) social utilities which address the customer’s relationship to others and finally 3) emotional utilities which address more individual demand.

Please rate the importance of the three dimensions below with the percentage of importance. The sum of the three dimensions should sum to 100.

Dimension of utility	Importance
Functional utility	
Social utilities	
Emotional utility	
	100

Annex 3: Suggested improvement in the CIS

WP2 propose a new module of question to the existing Community Innovation Survey (CIS) as well as compile a package of question for a larger survey with design focus (Annex 4). Building on experience from the cognitive testing of previous alterations to the CIS, which according to Statistics Sweden is the most complex of statistical inquiries, two aspects are of core importance. Firstly, definitions as “innovative activity” need to be as clear as possible for the respondents as to what the definition refers to. What shall be included and what shall be excluded. Secondly, the detail of the measure imply in some cases that the respondent need to access information from other colleagues and/or archived data and/or make new calculations. For example the present CIS asks for expenditures of capital investments. However only the “innovative” capital investments are to be reported that is capital investments which are related to the introduction of new products and processes.⁴⁷

Suggested module/add-on to the CIS:⁴⁸

From previous chapter we now proceed to more detailed suggestions on an improved treatment of design in the CIS. CIS has limited of space the alterations with respect to design need to be economized kept to a minimum. While the proposed module of design can most reliable not change the structure of the current CIS this imply that suggested alterations need to be of in relation to current structure instead of proposing a new module which demands a restructuring of the entire CIS. The problem with creating a “design” module to be included in CIS is that design consists of elements which are treated in different part of this survey. Design as an innovative activity is treated in Annex 2. The design items which are elements of R&D can be assumed to be covered in the question regarding R&D expenditures (intra-mural and extra-mural). Thus design as an innovative technical and non-technical activity excluded of R&D need considerations. Design items which are related to marketing are implicitly covered in the section on innovation in marketing, section 10.1 need to be a more explicit treatment. The relevant sections of CIS are included as an appendix to this document.

⁴⁷ *Statistics Sweden (2012)*

⁴⁸ *Below is CIS section referred to according to Eurostat harmonized CIS, see Annex 6*

Table 13 General questions on the fit between design and descriptions and measures in the CIS

Section	Content	Questions to be asked of managers in firms
2	Description of product innovation	How does design fit in this section?
3	Description of product innovation	Is this an area where you can see design as a component?
4	On-going or abandoned innovation activities	Is the word activity clear? Does it need to be described?
5.1	Activities and expenditures for product and process innovations	How well does this set of activities reflect your view of design?
8	Organizational innovation	Does design play a role in organizational innovation? If so, how?
9	Marketing innovation	How does design fit in this section?
11	Strategies	Design as a tool for reaching strategic goals
12	Basic information on your enterprise	In order to estimate returns with respect to value-added a new question needs to be included regarding total sum of outside purchases. Test if this implies that this creates a larger burden for the respondent.

**Note: Section refers to the Eurostat version of CIS*

Design inputs CIS

In present CIS section 5.1 on innovation activities pursued in recent three years measures whether the firm have been engaged in:⁴⁹

Table 14 Alternative changes to CIS (alterations by €design in *italics*)

2 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 of sub-systems.		
<ul style="list-style-type: none"> 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 or institutions. 		
2.1 During the three years 2010 to 2012, did your enterprise introduce:		
		Yes
		No
Goods innovations: New or significantly improve goods (exclude the simple resale of new good <i>and changes of a solely aesthetic nature</i>)		
Service innovations: New or significantly improve services		
2.X What was the main character of the innovation?		
		Yes
		No
d)	Functional	
	<i>improvement</i>	
e)	Immaterial/intangible	
	<i>improvement</i>	
	<i>For example appealing to aesthetics/forms/ the consumer perception of meaning</i>	

⁴⁹ See Annex 6 for the full CIS questionnaire

f)

Combination of a) and b)

Table 15 Alternative changes to CIS section 5 (alterations by €design in *italics*)

5. Activities and expenditures for product and process innovations
*Did your enterprise engage in the following innovation activities:
 For each activity indicate a your engagement during 2010 and 2012 and the expenditures of the engagement in the activity for 2012
 For each activity also indicate the proportion of **design** in 2012 where design should be understood as work with a user focus with respect to functional and intangible utilities. (Examples of the latter are aesthetical appearance, form and appeal to customer/user perception of meaning and identity.)*

With a lack of precise accounting data please use estimates

Innovation activity	Activity 2010-2012		Expenditure 2012	Estimated proportion of design in 2012
	Yes	No		
New knowledge				
In-house research	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Externally purchased research	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Development of new or improved products and processes				
In-house development	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Externally purchased development	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Market introductions				
In-house activities	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Externally purchased activities	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Training for innovations				
In-house or contracted out training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Acquisition of knowledge				
Acquisitions of know-how, copyrighted works, patented and non-patented invention, etc. from other enterprises or organisations for the development of new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Acquisition of Equipment				
Acquisitions of advance machinery, equipment ,software and buildings to be used for new or significantly improved products or processes	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%
Other				
Other in-house or contracted out activities to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering etc.	<input type="checkbox"/>	<input type="checkbox"/>	_____€	_____%

Table 16 Alternative 2 changes to CIS section 5 (alterations by €design in *italics*)

<p>Given this definition, what proportion of investment in each of these innovation activities is design?</p> <p><i>For each activity also indicate the proportion of design in 2012 where design should be understood as work with a user focus with respect to functional and intangible utilities. (Examples of the latter are aesthetical appearance, form and appeal to customer/user perception of meaning and identity.)</i></p>							
	<10%	10-20%	20-30%	30-50%	50-75%	>75%	Don't know
<p>Creation of new knowledge (<i>Research and development activities undertaken by your enterprise to create new knowledge or to solve scientific or technical problems (include software development in-house that meets this requirement)</i></p>	<input type="checkbox"/>						
<p>Development of product and processes</p>	<input type="checkbox"/>						
<p>Market introduction of innovations</p>	<input type="checkbox"/>						

Note: The intervals suggested must be based on empirical evidence on the frequencies in the population of enterprises

Table 17 Alternative changes to CIS section 8(alterations by €design in *italics*)

<p>Section 8 Organisational innovation <i>If your enterprise introduced any of the items specified in 8.1 please estimate how much spending in total of such innovative activities?</i> <i>For each activity also indicate the proportion of design in 2012 where design should be understood as work with a user focus with respect to functional and intangible utilities. (Examples of the latter are aesthetical appearance, form and appeal to customer/user perception of meaning and identity.)</i></p>	<p>Expenditure _____€</p>	<p>Estimated proportion of design in 2012 _____%</p>
--	--	---

Table 18 Alternative changes to CIS section 9(alterations by €design in *italics*)

<p>Section 9 Marketing Innovations <i>If your enterprise introduced any of the items specified in 9.1 please estimate how much spending in total of such innovative activities?</i> <i>For each activity also indicate the proportion of design in 2012 where design should be understood as work with a user focus with respect to functional and intangible utilities. (Examples of the latter are aesthetical appearance, form and appeal to customer/user perception of meaning and identity.)</i></p>	<p>Expenditure _____€</p>	<p>Estimated proportion that relates do user centred functional and intangible utilities _____%</p>
--	--	--

Table 19 Changes to CIS section on enterprise strategies (alterations by €design in *italics*)

Section 11.2 During 2010 to 2012, how important were each of the following strategies for reaching your enterprise's goals?	Degree of Importance			
	High	Medium	Low	Not relevant
	□	□	□	□
Developing new markets within Europe*	□	□	□	□
Developing new markets outside Europe*	□	□	□	□
Reducing in-house costs of operation	□	□	□	□
Reducing costs of purchased materials, components or services	□	□	□	□
Introducing new or significantly improved goods or services	□	□	□	□
<i>Competing by offering lower cost to customers</i>	□	□	□	□
<i>Competing by offering improved performance and functionality</i>	□	□	□	□
<i>Competing by offering improved user experience in appearance, packaging and branding</i>	□	□	□	□
Intensifying or improving the marketing of goods or services	□	□	□	□
Increasing flexibility / responsiveness of your organisation	□	□	□	□
Building alliances with other enterprises or institutions	□	□	□	□

Table 20 Alternative changes to CIS section 12(alterations by €design in *italics*)

Section 12: After 12.2 insert	
<i>What was your enterprise total cost for labour inputs</i>	_____€
<i>What was your enterprise's total purchase of inputs (goods and services)?</i>	_____€

Note. This information is crucial in order to estimate the contribution to value added.

CIS population

The population of enterprises surveyed in CIS do not cover all sectors in the economy. Sectors like retail, hotel and restaurants and constructions are not included. If estimates from the CIS are to be used to evaluate the contribution to GDP this must be handled. One way is to use information on labour working in design occupations as a two for producing correct weights.

Still left out

The growth of productivity has several sources innovation in the CIS-perspective is just one. Other sources to growth not included are the lingering effect of earlier investments both in real capital (fixed assets) and in immaterial assets.

The longevity of design

Chapter 2 referred to the production function framework for estimating the contribution of R&D to productivity where the stock of R&D plays a role in current productivity. This is the main reason for the Immaterial Asset Survey in the UK measuring the stock of such assets by the enterprise own estimation of the longevity of their investments. However we conclude that to add this item into present CIS will increase further the complexity of the survey.

Design management measurement in the CIS

Another source of productivity growth is improvement of management. As referred in chapter 3 there are evidence that all things equal better management creates higher productivity. The management of design is a specific skill which is acknowledged in design surveys. The current CIS do not measure management issues in other innovative activities. In this respect the CIS make standard assumptions in economics that the competitive environment drives all enterprises to a similar management quality. The neglect of measure this will lead to a larger error or unexplained part. To propose an inclusion of design management measurement in CIS change this balance and demands that similar management for R&D and human resource management are included which is an issue for other projects.

As this is the case we suggest that design management is not included in the CIS measurement of design.

Disadvantages and limits with the CIS survey as measurement tool

CIS is the most utilized tool for measurement of innovation at the enterprise level. To incorporate a relevant treatment of design in the CIS is thus an important task in itself. However as a tool to measure the economy wide usage of design CIS has limitations. Rueda et al reports that the British CIS underreports the measurement of R&D compared to the standard survey measuring R&D in businesses, £11bn compared to £13.5bn or approx. 19%. The difference in pop coverage, low response rates in CIS with probable systematic bias in non-response items. The measurement of design in British CIS (2004) of £1.75bn compared to the identified “purchased” design services of £17bn in Galindo-Rueda et al is substantially lower and need more research for an explanation.

Annex 4: Suggested content on a harmonized design survey

As been noted in Annex 2 survey measuring the extent of business use of design has been made in several EU member states. In several countries like the UK, Denmark, Sweden and Austria these surveys has had a common structure. Below is the structure in the Swedish survey 2008.

1. Introduction with description of definition of design
2. Profile of business surveyed
 - a. Market focus (B2B/B2C)
 - b. Turnover (latest year, recent years)
 - c. Export
 - d. Introduction of innovations
3. Use of design
 - a. Areas where design activities might be present recent 12 months
 - b. View of design in the enterprise
 - c. Which phase do the enterprise generally initiate design activities
 - d. Relative change in design investments (%) recent years
 - e. External expenditures on design
 - f. Number of employees working with design
 - i. Main task/Partly task
 - ii. Design skilled (higher exam)
4. The significance of design and other factors
 - a. Design impact the recent 12 months
 - b. Other general factors influencing success in business
 - c. Market development and design requirement
 - d. Direct utility of design
 - e. Compare your design activities with your competitors
5. Other areas: User/customer interaction

In Annex 1 the model for estimating the return to a factor of production requires that other factors of production are considered. The return of design should in other words be net of the influence of other co-factors. The measurement tool thus needs to measure other relevant factors of production. Together with the expenditure on design one need to collect data on expenditures on R&D, capital investments, skill development and so on and so forth. The straightforward thing to do is to include question similar to the CIS on these items.

- 1) R&D, intramural
- 2) R&D extramural
- 3) Acquired capital equipment (software)
- 4) Sourced external knowledge (exclusive of outsourced of design services)
- 5) Training of staff as a component of innovation
- 6) Market introductions of innovations
- 7) Other innovative activity

Annex 5: Measuring design by the means of labour statistics and work task statistics

2.4 The Coinvest measurement

In the measurement of investment in innovation design emerges as a component within the label innovative property. How is this measured? Below we reiterate the application by a Swedish researcher who participated in the EU project Coinvest.⁵⁰

The design services are identified in the nomenclature of NACE (EU standard) as the aggregate of Architectural, Engineering and Design services measured in the code: 742⁵¹. In order to estimate enterprise extramural spending on design one starts with the turnover of this specific industry. However in order to identify the share with design content of the industry turnover the total turnover is weighted by the share of employed in the industry with a design occupation according to the nomenclature ISCO88. Following occupations are identified as related to design:⁵²

- Architects and town planners (ISCO88 2141)
- Civil engineers (ISCO88: 2142)
- Electrical engineers (ISCO88: 2143)
- Electronics and telecommunications engineers (ISCO88: 2144)
- Mechanical engineers (ISCO88: 2145)
- Chemical engineers (ISCO88: 2146)
- Designers, Decorators & Commercial designers (ISCO88: 3471)

Thus the weight (the ratio):

Sum of all employed in industry 742 with design related occupation = $N^{742AED} /$

Sum of all employed in industry 742 = N^{742}

is calculated. This weight is multiplied by the turnover of the industry (Y^{742}) yielding the estimate of extramural spending on design Y_p .

Next we estimate the design spending within the industries external to the AED-services, i.e. all other sectors own-account design spending. This estimate builds on the one hand on the ratio of the extra-mural Y_p and the wage bill of designers (wN^{742AED}) and on the other hand with the total wage bill of persons with design occupation working outside the AED-services (wN^{xAED}). The product of the two is the enterprises own account spending.

$$Y_{own} = (Y_p / wN^{742AED}) * wN^{xAED}$$

Total spending on design amounts to:

⁵⁰ Edquist (2009) *Can Investment in Intangibles Explain the Swedish Productivity Boom in the 1990s*, IFN Working paper No 809, 2009. However Edquist builds on the paper Colinda-Rueda Haskel & Pesole (2008) "How much does the UK employ, spend and invest in design?" CeRiBA WP april <http://spiral.imperial.ac.uk/bitstream/10044/1/5971/1/Haskel%202010-05.pdf>

⁵¹ The NACE code used by the researcher is the "old" NACE 1.1 which is now replaced by NACE rev2: http://epp.eurostat.ec.europa.eu/portal/page/portal/nace_rev2/transition_nacerev1.1_nacerev2

⁵² <http://www.ilo.org/public/english/bureau/stat/isco/isco88/major.htm>

$$Y_{design} = Y_{own} + Y_p$$

Next question is how large is the fraction of the spending which can be considered as investment i.e. lasts longer than a year. Here the methods are even more crude than in a rudimentary state (Corrado et al 2005). The researchers Gallindo-Rueda, Haskel and Pesole (2008 see footnote 5) discusses this (p 15f) and list following examples:

(a) *Design of a small kitchen utensil improving its handling and appearance:* The design can be used in the mass production of these utensils over more than a year. It is appropriate to treat the design expenditures as capital formation.

(b) *Design of a clothing range for a particular season:* The design is used in the production of the clothing items (tailored or mass-produced) but only over one period of time. No design asset is created although the design does add value to the clothing items. It is appropriate for them to be treated as intermediate consumption.

(c) *Architectural or engineering design entirely specific to a unique building or piece of transport equipment:* In these examples, it is appropriate to treat all knowledge created as being used up in the production of the final good, which happens to be a tangible asset.

(d) *Architectural or engineering design for a building or piece of transport equipment suitable for mass production:* In these examples, the design is the blueprint which is used to make copies but is not exhausted. Investment is recorded as the buildings / transport equipment items are acquired, but also as the knowledge embodied in the blueprint is created. The cost of the final items reflects the capital services provided by the original design. (p 16)

The researchers conclude that whether the causal effect of design is immediate or influence the output over a longer period of time is an empirical question. The researcher continues to what empirical data can supply with an answer and the first alternative is the British Design Councils survey (Design council 2004 2005? table 6.2). This survey concludes that approximately 50 per cent of the firm surveyed had introduced a new product or service. These firms were asked:

“How is design used on the development of new product (/service in your firm?)”

The answers were distributed as:

14% did not use design at all, 16% that design said it leads and guides the whole process, 13% design is used in all stages, 38% that design was used in specific stages and finally 20% that design was used in a limited extent.

From this Gallindo-Rueda et al concludes that if 86% of 50% of the firms used design in some extent in the production of new products and services might be an upper bound for the incidence of design as investment. The UK CIS collects data on the expenditure of design for firms which have introduced new products or processes. Design spending for these is estimated as 9 per cent of the total expenditures on innovation activities. The researcher concludes that this gives the design as innovation an interval between 9 and 86 per cent which is considered as too wide to be comfortable and they simply take the average thereof and proceed with the assumption that the investment share of design spending is 50 per cent.

2.5 The use of work task statistics in the US

The definition of design as an activity of the integration of functional, emotional and social values is limited by the CIS questionnaire scope. Design as an integrator puts focus on the allocation of tasks and the skills to pursue those tasks. However this demands data on tasks and skills for different occupations. The US Occupational Information Network a US Department of Labour sponsored project, has a wealth of such kind of data.⁵³

OECD is now conducting a study using this information where the object of study is the persons involved in design activities defined as the tasks and the skills connected with design, like:

- **abilities** (cognitive – originality, visualisation, category flexibility)
- **knowledge** (design techniques, tools, principles, production of drawings, models etc.
- **Skills** (e.g. critical thinking, science, problem solving, technical skills specifically technology design, social and system skills).
- **Activities** (thinking creatively, analysing data, output – drafting, laying out, specifying, independence, artistic)

Thus type of questionnaire to monitor the tasks and the capacities of people involved in design activities from this perspective is very different to the CIS questionnaire and is addressing a different population: people, instead of enterprises.⁵⁴

The type of data above is very expensive to collect. However as a link to an enterprise expenditure/investment perspective they can perhaps identify categories of key occupations in the enterprise building of knowledge-based capital which thus are important to measure separately in enterprise surveys.

⁵³ <http://www.onetcenter.org/database.html>

⁵⁴ See Squicciarini m & Le Mouel (2012) “Defining and Measuring investment in organizational capital: Using US Mirodata to Develop a Task-based Approach” OECD STI wp 2012/05 for an application. Other OECD work in progress contact Mr Fernando Galindo-Rueda at the OECD (fernando.galindo-rueda@oecd.org)

Annex 6: The CIS questionnaire

A Eurostat draft from September 2012 (not the final for the 2013 CIS-survey).

The Community Innovation Survey 2012

the harmonised survey questionnaire 2012

The Community Innovation Survey 2012

This survey collects information on your enterprise's innovations and innovation activities during the three years 2010 to 2012 inclusive.

An innovation is the introduction of a new or significantly improved product, process, organisational method, or marketing method by your enterprise.

An innovation must have characteristics or intended uses that are new or which provide a significant improvement over what was previously used or sold by your enterprise. However, an innovation can fail or take time to prove itself.

An innovation need only be new or significantly improved for your enterprise. It could have been originally developed or used by other enterprises.

Sections 2 to 7 only refer to product and process innovations. Organisational and marketing innovations are covered in sections 8 and 9.

Please complete **all** questions, unless otherwise instructed.

Person we should contact if there are any queries regarding the form:

Name: _____
 Job title: _____
 Organisation: _____
 Phone: _____
 Fax: _____
 E-mail: _____

1. General information about the enterprise

Name of enterprise _____
 Address⁵⁵ _____
 Postal code _____ Main activity⁵⁶ _____

1.1 In 2012, was your enterprise part of an enterprise group? (A group consists of two or more legally defined enterprises under common ownership. Each enterprise in the group can serve different markets, as with national or regional subsidiaries, or serve different product markets. The head office is also part of an enterprise group.)

Yes No

In which country is the head office of your group located? ⁵⁷ _____

If your enterprise is part of an enterprise group: Please answer all further questions about your enterprise only for the enterprise for which you are responsible in Sweden. Exclude all subsidiaries or parent enterprises.

1.2 During the three years 2010 to 2012, did your enterprise:

	Yes	No
Merge with or take over another enterprise	<input type="checkbox"/>	<input type="checkbox"/>
Sell, close or outsource some of the tasks or functions of your enterprise	<input type="checkbox"/>	<input type="checkbox"/>
Establish new subsidiaries in Sweden or in other European countries*	<input type="checkbox"/>	<input type="checkbox"/>
Establish new subsidiaries outside Europe	<input type="checkbox"/>	<input type="checkbox"/>

1.3 In which geographic markets did your enterprise sell goods and/or services during the three years 2010 to 2012?

	Yes	No
A. Local / regional within Sweden	<input type="checkbox"/>	<input type="checkbox"/>
B. National (other regions of Sweden)	<input type="checkbox"/>	<input type="checkbox"/>
C. Other European Union or associated countries* ⁵⁸	<input type="checkbox"/>	<input type="checkbox"/>
D. All other countries	<input type="checkbox"/>	<input type="checkbox"/>

Which of these geographic areas was your largest market in terms of turnover during the three years 2010 to 2012? (Give corresponding letter) _____

⁵⁵ NUTS 2 code

⁵⁶ NACE 4 digit code

⁵⁷ Country code according to ISO standard

*: Include the following European Union (EU) and associated countries: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Ireland, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Slovakia, Switzerland, Turkey, Spain and the United Kingdom.

2. 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 or institutions.

A **good** is usually a tangible object such as a smartphone, 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.

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

	Yes	No
Goods innovations: <i>New or significantly improved goods (exclude the simple resale of new goods and changes of a solely aesthetic nature)</i>	<input type="checkbox"/>	<input type="checkbox"/>
Service innovations: <i>New or significantly improved services</i>	<input type="checkbox"/>	<input type="checkbox"/>

If no to all options, go to section 3

Otherwise go to question 2.2

2.2 Who developed these product innovations?

	<i>Tick all that apply</i>	
	Goods innovations	Service innovations
Your enterprise by itself	<input type="checkbox"/>	<input type="checkbox"/>
Your enterprise together with other enterprises or institutions*	<input type="checkbox"/>	<input type="checkbox"/>
Your enterprise by adapting or modifying goods or services originally developed by other enterprises or institutions*	<input type="checkbox"/>	<input type="checkbox"/>
Other enterprises or institutions*	<input type="checkbox"/>	<input type="checkbox"/>

*: Include independent enterprises plus other parts of your enterprise group (subsidiaries, sister enterprises, head office, etc). Institutions include universities, research institutes, non-profits, etc.

2.3 Were any of your product innovations (goods or services) during the three years 2010 to 2012:

		Yes	No
New to your market?	Your enterprise introduced a new or significantly improved product onto your market before your competitors (it may have already been available in other markets)	<input type="checkbox"/>	<input type="checkbox"/>
Only new to your firm?	Your enterprise introduced a new or significantly improved product that was already available from your competitors in your market	<input type="checkbox"/>	<input type="checkbox"/>

Using the definitions above, please give the percentage of your total turnover⁵⁹ in 2012 from:

New or significantly improved products introduced during the three years 2010 to 2012 that were new to your market	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> %			
New or significantly improved products introduced during the three years 2010 to 2012 that were only new to your firm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> %			
Products that were unchanged or only marginally modified during the three years 2010 to 2012 (include the resale of new products purchased from other enterprises)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> %			
Total turnover in 2012	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px; text-align: center;">1</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> <td style="width: 20px; height: 20px; text-align: center;">0</td> </tr> </table> %	1	0	0
1	0	0		

2.4 To the best of your knowledge, were any of your product innovations during the three years 2010 to 2012:

	Yes	No	Don't know
A first in Sweden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A first in Europe*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A world first	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**: Include the following European Union (EU) and associated countries: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Ireland, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Slovakia, Switzerland, Turkey, Spain and the United Kingdom.⁶⁰*

If no world-first product innovations go to Section 3, otherwise go to question 2.5

2.5 What percent of your total turnover in 2012 was from world first product innovations introduced between 2010 and 2012? (This should be a subset of your new-to-market turnover share in question 2.3 above)

0% to less than

⁵⁹ For Credit institutions: Interests receivable and similar income, for insurance services: Gross premiums written

- 1%
- 1% to less than 5%
- 5% to less than 10%
- 10% to less than 25%
- 25% or more
- Don't know

3. 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 or institutions.
- Exclude purely organisational innovations – these are covered in section 8.

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

	Yes	No
New or significantly improved methods of manufacturing or producing goods or services	<input type="checkbox"/>	<input type="checkbox"/>
New or significantly improved logistics, delivery or distribution methods for your inputs, goods or services	<input type="checkbox"/>	<input type="checkbox"/>
New or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing	<input type="checkbox"/>	<input type="checkbox"/>

If no to all options, go to section 4

Otherwise go to question 3.2

3.2 Who developed these process innovations?

	<i>Tick all that apply</i>
Your enterprise by itself	<input type="checkbox"/>
Your enterprise together with other enterprises or institutions*	<input type="checkbox"/>
Your enterprise by adapting or modifying processes originally developed by other enterprises or institutions*	<input type="checkbox"/>
Other enterprises or institutions*	<input type="checkbox"/>

*: Include independent enterprises plus other parts of your enterprise group (subsidiaries, sister enterprises, head office, etc). Institutions include universities, research institutes, non-profits, etc.

3.3 Were any of your process innovations introduced during the three years 2010 to 2012 new to your market?

- Yes
 No
 Don't know

4. Ongoing or abandoned innovation activities for product and process innovations

Innovation activities include the acquisition of machinery, equipment, software, and licenses; engineering and development work, design, training, and marketing when they are *specifically* undertaken to develop and/or implement a product or process innovation. Also include all types of R&D activities.

4.1 During the three years 2010 to 2012, did your enterprise have any innovation activities that did not result in a product or process innovation because the activities were:

	Yes	No
Abandoned or suspended before completion	<input type="checkbox"/>	<input type="checkbox"/>
Still ongoing at the end of the 2012	<input type="checkbox"/>	<input type="checkbox"/>

If your enterprise had no product or process innovations or innovation activity during the three years 2010 to 2012 (no to all options in questions 2.1, 3.1, and 4.1), go to section 8

Otherwise, go to section 5

5. Activities and expenditures for product and process innovations

5.1 During the three years 2010 to 2012, did your enterprise engage in the following innovation activities:

		Yes	No
In-house R&D	Research and development activities undertaken by your enterprise to create new knowledge or to solve scientific or technical problems (include software development in-house that meets this requirement) If yes, did your enterprise perform R&D during the three years 2010 to 2012: Continuously (your enterprise has permanent R&D staff in-house) <input type="checkbox"/> Occasionally (as needed only) <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
External R&D	R&D that your enterprise has contracted out to other enterprises (including other enterprises in your group) or to public or private research organisations	<input type="checkbox"/>	<input type="checkbox"/>

Acquisition of machinery, equipment, software & buildings	Acquisition of advanced machinery, equipment, software and buildings to be used for new or significantly improved products or processes	<input type="checkbox"/>	<input type="checkbox"/>
Acquisition of existing knowledge from other enterprises or organisations	Acquisition of existing know-how, copyrighted works, patented and non-patented inventions, etc. from other enterprises or organisations for the development of new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>
Training for innovative activities	In-house or contracted out training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes	<input type="checkbox"/>	<input type="checkbox"/>
Market introduction of innovations	In-house or contracted out activities for the market introduction of your new or significantly improved goods or services, including market research and launch advertising	<input type="checkbox"/>	<input type="checkbox"/>
Design	In-house or contracted out activities to design or alter the shape or appearance of goods or services	<input type="checkbox"/>	<input type="checkbox"/>
Other	Other in-house or contracted out activities to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering, etc.	<input type="checkbox"/>	<input type="checkbox"/>

5.2 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.⁶¹

Please fill in '0' if your enterprise had no expenditures for an activity in 2012

With a lack of precise accounting data please use estimates

In-house R&D (Include current expenditures including labour costs and capital expenditures on buildings and equipment specifically for R&D)	<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td><td style="width: 12.5%;"></td> </tr> </table>										
External R&D	<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td><td style="width: 12.5%;"></td> </tr> </table>										
Acquisition of machinery, equipment, software & buildings (Exclude expenditures on these items that are for R&D)	<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td><td style="width: 12.5%;"></td> </tr> </table>										
Acquisition of existing knowledge from other enterprises or institutions	<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td><td style="width: 12.5%;"></td> </tr> </table>										
All other innovation activities including design, training, marketing, and other relevant activities	<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td><td style="width: 12.5%;"></td> </tr> </table>										
Total expenditures on innovation activities (Sum of expenditures for all types of innovation activities)	<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td><td style="width: 12.5%;"></td> </tr> </table>										

⁶¹ Give expenditure data in 000's of national currency units to eight digits.

5.3 During the three years 2010 to 2012, did your enterprise receive any public financial support for innovation activities from the following levels of government? Include financial support via tax credits or deductions, grants, subsidised loans, and loan guarantees. Exclude research and other innovation activities conducted entirely for the public sector* under contract.

	Yes	No
Local or regional authorities	<input type="checkbox"/>	<input type="checkbox"/>
Central government (including central government agencies or ministries)	<input type="checkbox"/>	<input type="checkbox"/>
The European Union (EU)	<input type="checkbox"/>	<input type="checkbox"/>
If yes, did your enterprise participate in the EU 7 th Framework Programme for Research and Technical Development?	<input type="checkbox"/>	<input type="checkbox"/>

**The public sector includes government owned organisations such as local, regional and national administrations and agencies, schools, hospitals, and government providers of services such as security, transport, housing, energy, etc.*

6. Sources of information and co-operation for product and process innovation

6.1 During the three years 2010 to 2012, how important to your enterprise's innovation activities were each of the following information sources? Include information sources that provided information for new innovation projects or contributed to the completion of existing projects.

		Degree of importance			
		<i>Tick 'not used' if no information was obtained from a source.</i>			
	Information source	High	Medium	Low	Not used
Internal	Within your enterprise or enterprise group	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Market sources				
	Suppliers of equipment, materials, components, or software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Clients or customers from the private sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Clients or customers from the public sector*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Competitors or other enterprises in your industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Consultants and commercial labs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Education & research institutes	Universities or other higher education institutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Government, public or private research institutes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other sources	Conferences, trade fairs, exhibitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Scientific journals and trade/technical publications</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Professional and industry associations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.2 During the three years 2010 to 2012, did your enterprise co-operate on any of your innovation activities with other enterprises or institutions?

Innovation co-operation is active participation with other enterprises or institutions on innovation activities. Both partners do not need to commercially benefit. Exclude pure contracting out of work with no active co-operation.

- Yes No (Please go to question 7.1)

6.3 Please indicate the type of innovation co-operation partner by location

(Tick all that apply)

Type of co-operation partner	Sweden	Other Europe**	United States	China or India	All other countries
A. Other enterprises within your enterprise group	<input type="checkbox"/>				
B. Suppliers of equipment, materials, components, or software	<input type="checkbox"/>				
C. Clients or customers from the private sector	<input type="checkbox"/>				
D. Clients or customers from the public sector*	<input type="checkbox"/>				
E. Competitors or other enterprises in your sector	<input type="checkbox"/>				
F. Consultants and commercial labs	<input type="checkbox"/>				
G. Universities or other higher education institutions	<input type="checkbox"/>				
H. Government, public or private research institutes	<input type="checkbox"/>				

6.4 Which type of co-operation partner did you find the most valuable for your enterprise's innovation activities? (Give corresponding letter) _____

*The public sector includes government owned organisations such as local, regional and national administrations and agencies, schools, hospitals, and government providers of services such as security, transport, housing, energy, etc.

** Include the following European Union (EU) and associated countries: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Ireland, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Slovakia, Switzerland, Turkey, Spain and the United Kingdom.

7. Competitiveness of your enterprise's product and process innovations

7.1 How effective were the following methods for maintaining or increasing the competitiveness of product and process innovations introduced during 2010 to 2012?

	Degree of effectiveness			
	High	Medium	Low	Not used
Patents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Design registration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Copyright	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trademarks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Lead time advantages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Complexity of goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secrecy (include non-disclosure agreements)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. 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.

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

	Yes	No
New business practices for organising procedures (i.e. supply chain management, business re-engineering, knowledge management, lean production, quality management, etc)	<input type="checkbox"/>	<input type="checkbox"/>
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)	<input type="checkbox"/>	<input type="checkbox"/>
New methods of organising external relations with other firms or public institutions (i.e. first use of alliances, partnerships, outsourcing or sub-contracting, etc)	<input type="checkbox"/>	<input type="checkbox"/>

9. 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.

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

	Yes	No
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)	<input type="checkbox"/>	<input type="checkbox"/>
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)	<input type="checkbox"/>	<input type="checkbox"/>
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)	<input type="checkbox"/>	<input type="checkbox"/>

New methods of **pricing** goods or services (*i.e. first time use of variable pricing by demand, discount systems, etc*)

10. Public sector procurement and innovation

10.1 During the three years 2010 to 2012, did your enterprise have any procurement contracts to provide goods or services for:

	Yes	No
Domestic public sector organisations*	<input type="checkbox"/>	<input type="checkbox"/>
Foreign public sector organisations*	<input type="checkbox"/>	<input type="checkbox"/>

**The public sector includes government owned organisations such as local, regional and national administrations and agencies, schools, hospitals, and government providers of services such as security, transport, housing, energy, etc.*

**If no to both options go to section 11
Otherwise go to question 10.2**

10.2 Did your enterprise undertake any innovation activities as part of a procurement contract to provide goods or services to a public sector organisation? (Include activities for product, process, organisational and marketing innovations)

(If your enterprise had several procurement contracts, tick all that apply)

Yes and innovation required as part of the contract	<input type="checkbox"/>
Yes but innovation <i>not</i> required as part of the contract	<input type="checkbox"/>
No	<input type="checkbox"/>

11. Strategies and obstacles for reaching your enterprise’s goals

11.1 During the three years 2010 to 2012, how important were each of the following goals for your enterprise? (It does not matter if your enterprise was able to attain these goals)

	Degree of Importance			Not relevant
	High	Medium	Low	
Increase turnover	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increase market share	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Decrease costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increase profit margins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11.2 During 2010 to 2012, how important were each of the following strategies for reaching your enterprise's goals?

	Degree of Importance			
	High	Medium	Low	Not relevant
Developing new markets within Europe*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developing new markets outside Europe*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reducing in-house costs of operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reducing costs of purchased materials, components or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Introducing new or significantly improved goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intensifying or improving the marketing of goods or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increasing flexibility / responsiveness of your organisation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Building alliances with other enterprises or institutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11.3 During 2010 to 2012, how important were the following factors as obstacles to meeting your enterprise's goals?

	Degree of Importance			
	High	Medium	Low	Not relevant
Strong price competition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strong competition on product quality, reputation or brand	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of demand	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovations by competitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dominant market share held by competitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of qualified personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of adequate finance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High cost of access to new markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High cost of meeting government regulations or legal requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*: Include the following European Union (EU) and associated countries: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Ireland, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Slovakia, Switzerland, Turkey, Spain, Sweden and the United Kingdom.

12. Basic economic information on your enterprise

12.1 What was your enterprise's total turnover for 2010 and 2012?⁶² Turnover is defined as the market sales of goods and services (Include all taxes except VAT⁶³)

2010	2012																				
<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td> </tr> </table>											<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td> </tr> </table>										

12.2 What was your enterprise's average number of employees in 2010 and 2012?⁶⁴

2010	2012												
<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td> </tr> </table>							<table border="1" style="border-collapse: collapse; width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td> </tr> </table>						

12.3 Approximately what percent of your enterprise's employees in 2012 had a tertiary degree?⁶⁵

- 0%
- 1% to less than 5%
- 5% to less than 10%
- 10% to less than 25%
- 25% to less than 50%
- 50% to less than 75%
- 75% or more

⁶² Give turnover in '000 of national currency units. Leave space for up to nine digits.

⁶³ For Credit institutions: Interests receivable and similar income; for Insurance services give gross premiums written.

⁶⁴ If administrative data are used and the annual average is not available, give results for the end of each year. Leave space for up to six digits for question 12.2.

⁶⁵ ISCED 2011 levels 5 to 8.

Annex 7: Literature

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