Design ecosystems and innovation policy in Europe

Anna Whicher

awhicher@cardiffmet.ac.uk

Cardiff Metropolitan University, 200 Western Avenue, CF5 2YB, Cardiff, Wales, United Kingdom

Abstract

In 2015, 15 of the 28 European Member States had design included in national innovation policy and between 2012 and 2016, design action plans have been adopted by governments in Denmark, Estonia, Finland, France, Ireland and Latvia as well as by the European Commission. Long misunderstood by companies and government as styling, design is a user-centred approach to problem-solving that can be applied across the private and public sectors. Design has attracted the attention of policy-makers as a factor for innovation as part of a paradigm shift in Europe where the remit of innovation policy is expanding. In the same way that innovation policy is based on an analysis of the Innovation Ecosystem, design researchers have demonstrated that design policy should be based on an analysis of the Design Ecosystem. Finland was the first country to adopt the concept of a National Innovation System to inform innovation policy in 1992 and it was also the first country to adopt the concept of a Design Ecosystem to inform its design policy in 2013. The European Commission's Action Plan for Design-driven Innovation encourages all European countries to integrate design into innovation policy and develop design action plans. However, this raises the fundamental question of how government can effectively develop design policy. Through a consensus building process with policy-makers, academics and design centre managers, various components of a Design Ecosystem were explored and tested. The processes resulted in a consolidated Design Ecosystem model with nine components: (1) users, (2) support, (3) promotion, (4) actors, (5) designers, (6) education, (7) research, (8), funding, and (9) policy. The Design Ecosystem model advocates that a policy should consider every aspect of the ecosystem to ensure a balance between supply of and demand for design expertise.

Keywords: design ecosystem, innovation policy, design policy.

Introduction

In recent years there has been a proliferation of design action plans, policies and strategies in Europe. From 2000 to 2009, only Finland and Denmark launched dedicated design policies: "Design2005!" and "DesignDenmark", respectively. However, since 2010, governments in Denmark, Estonia, Finland, France, Ireland and Latvia as well as the European Commission have developed Design Action Plans. Long misunderstood by companies and government as styling, design is a user-centred approach to problem-solving that can be applied across the private and public sectors. Design has attracted the attention of policy-makers as a factor for innovation as part of a paradigm shift in Europe where the remit of innovation policy is expanding. In the same way that innovation policy is based on an analysis of the Innovation Ecosystem, design researchers have proposed that design policy should be based on an analysis of the Design Ecosystem. Finland was the first country to adopt the concept of a National Innovation System to inform innovation policy in 1992 (Sharif, 2006) and it was also the first country to adopt the concept of a Design Ecosystem to inform its design policy in 2013 (Ministry of Employment and the Economy, 2013). The European Commission's Action Plan for Design-driven Innovation encourages all European countries to integrate design into innovation policy and develop design action plans. However, this raises the fundamental question of how government can effectively develop design policy. Through a consensus building process with policy-makers, academics and design centre managers, various components of a Design Ecosystem were explored and tested. The processes resulted in a consolidated Design Ecosystem model with nine components: (1) users, (2) support, (3) promotion, (4) actors, (5) designers, (6) education, (7) research, (8), funding and (9) policy. The Design Ecosystem model advocates that a policy should consider every aspect of the ecosystem to ensure a balance between supply of and demand for design expertise.

Policy context

Innovation policy must continuously innovate itself to remain relevant (ProInno Europe, 2011). Innovation policy is the prime instrument whereby governments seek to support growth in companies and efficiency in the public sector. Since the early 2000s innovation policy has been undergoing a paradigm shift to broaden the scope beyond purely technological drivers of innovation to incorporate more user-centred drivers (Borras, 2003; Von Hippel, 2005). As part of this paradigm shift, design is becoming more relevant to innovation theory, practice and policy because at its core design is a people-centred competence. Although design and innovation are different, they share three com-

mon characteristics – both have evolved, both have expanded and both have converged on the user (Whicher, 2016). In 2010, for the first time, design was highlighted as one of ten priorities for innovation in the European Commission's ten-year policy "Innovation Union":

Europe must also develop its own distinctive approach to innovation which builds on its strengths and capitalises on its values by pursuing a broad concept of innovation, both research-driven innovation and innovation in business models, design, branding and services that add value for users and where Europe has unique talents. […] Design is of particular importance and is recognised as a key discipline and activity to bring ideas to the market, transforming them into user-friendly and appealing products.

To implement the objectives of Innovation Union, the European Commission funded six projects at a value of €4.8 million to accelerate the up-take of design in business strategies and government policies. One of these projects was the SEE Platform (Sharing European Experience on Design Innovation Policy) led by PDR at Cardiff Metropolitan University from 2012 to 2015 (www.seeplatform.eu). Through 112 hands-on workshops for over 1,000 policy-makers as well as new research and data on design, the SEE Platform successfully integrated design into 18 policies (national and regional) and 48 programmes (business mentoring and financing). Furthermore, the European Commission (2013) launched its Action Plan for Design-driven Innovation stating:

A more systematic use of design as a tool for user-centred and market-driven innovation in all sectors of the economy, complementary to R&D, would improve European competitiveness. Analyses of the contribution of design show that companies that strategically invest in design tend to be more profitable and grow faster.

To implement the objectives of the design action plan, the European Commission funded the Design for Europe initiative at a value of €3.8 million as one-stop-shop for businesses, the public sector and policy-makers from 2014 to 2017 (www.designforeurope.eu). There is still further to go on the journey to holistically integrating design into policy across Europe and the action plan is "one step in the longer term effort to highlight the role of design in innovation policy" (European Commission, 2013). However, from engaging with policy-makers through the SEE Platform it is evident that the route to building effective national and regional design capacity is not clear.

In 2015, 15 of the 28 European Member States had design included in national innovation policy including Belgium, the Czech Republic, Denmark, Estonia, Greece, Finland, France, Ireland, Italy, Latvia, Poland, Slovenia, Spain, Sweden and the UK (Whicher, 2016). These policy statements in favour of design range from a few sentences to entire chapters and from visions to specific actions. Of course, many more European countries and regions have active design programmes, design centres and well-rooted design traditions such as Germany and the

Netherlands but they do not have design articulated in a government policy document. This denotes the distinction between an explicit policy for design, where design is formally integrated into national policy and a tacit policy for design, where there is design infrastructure such as design support programmes, design centres and promotion activities. Examining innovation policies reveals to what extent governments value design. Design has been proven as a dynamic process for innovation that results in a competitive advantage for products and services. For example, the innovation policy "Knowledge-based Estonia" (Estonian Ministry of Education and Research, 2014) has the ambition to:

Support the strategic use of design in enterprises in order to increase the added value of products and services, and achieve international visibility. Increase the role of the public sector as the leader of innovation [including the] design of public services.

Similarly, the Polish policy "Operational Programme Intelligent Development 2014-2020" asserts that:

At present, enterprises, in particular SMEs, are not using opportunities created by industrial design. That is why [the Government] will contribute to the promotion of industrial design as one of the sources of competitive prevalence and, at the same time, to the growing interest of SMEs in conducting R&D (Polish Ministry of Regional Development, 2007).

Design is also recognised in some policies as a process for innovation in the public sector and tackling societal challenges; such as in the UK's "Innovation and Research Strategy for Growth" (Department for Business, Innovation and Skills, 2011):

Design thinking can play an important role in strengthening the public sector's capacity to be an intelligent customer as it involves bringing together different perspectives, including industry and users of a service or product, to understand needs. The use of design can deliver cost savings and improved efficiency in the delivery of public services and help to generate solutions to societal challenges.

The challenge with many of the innovation policies is that design only forms part of a grand vision for innovation and often there is not a corresponding implementation plan with specific design actions and budgets. Nevertheless, between 2012 and 2016, design action plans have been adopted by governments in Denmark, Estonia, Finland, France, Ireland and Latvia as well as the European Commission (Whicher, 2016). Perhaps one of the most ambitious design policies was for Ireland (see Table 1). In 2015, as part of the Action Plan for Jobs, the government invested €5 million in the Year of Irish Design (ID2015) initiative, a high profile national and international promotional campaign. By the end of the year, according to an interview with the Design and Crafts Council of Ireland, ID2015 had reached or exceeded all its anticipated impact (Table 1).

Table 1. Targets and impact of the Irish design policy 2015.

Target in the Action Plan for Jobs 2015	Impact by January 2016
1,800 new jobs in design	4,000 new jobs in design created
200 new design businesses	370 new design businesses registered
€10 million in design-related exports	€19 million in design-related exports generated
3 million audience at home and abroad	28.5 million engaged at home and abroad through 670 projects including 100 internationally
300 companies at international trade missions	476 companies showcased in 23 countries

According to the Minister for Business: "The Irish Government will work with the design sector to bring design into the heart of enterprise policy and to lose its status as the Cinderella of Ireland's innovation strategy and action plans" (Design for Europe, 2016a). During ID2015, the government also commissioned research on the role of design in Irish enterprises conducted by PDR and CM International as well as a mapping of the Design Ecosystem in Ireland. Consequently, in early 2016, the government launched its "Policy Framework for Design in Ireland" with actions such as to increase the use of design-driven innovation in enterprises, build scale in the design sector, develop skills in design and encourage more women to take-up design roles. According to the government, "design-driven innovation is an important dimension of the innovation ecosystem" (Irish Department for Jobs, Enterprise and Innovation, 2016).

Theory

Government intervention for innovation has been justified by systems failure theory. According to its progenitors Freeman (2004, 1995) and Lundvall (1988, 1992) innovation policy should be based on an analysis of the National Innovation System (NIS). Intriguingly, design was a consideration in Freeman's earliest concept of a National Innovation System (Freeman *in* Sharif, 2006, p. 751):

> when we are considering national innovation systems (as opposed to global civilization and the world economy) then at least in the past [scientific discoveries] have not been so central to innovative success as those types of creativity which are characteristic of the engineer in the work of invention and design.

Here Freeman asserts the positive contribution of design and creativity to the innovation system. However, due to the difficulties of capturing design impact, for expediency, it was latterly overlooked by subsequent innovation theorists (Freeman, 1995, p. 9-10):

> despite the fact that the authors pointed out that technical change did not depend just on R&D but on many other related activities, such as education, training, production engineering, design, quality control, etc., nevertheless R&D measures were very frequently used as a surrogate for all these activities which helped to promote new and improved products and processes.

Again, design is cited as a driver of innovation but due to the lack metrics, R&D became the de facto proxy for assessing the performance of NIS. Over time, the concept of NIS has been constructed, deconstructed and reconstructed by scholars and policy-makers. More recently, national innovation systems have evolved into the concept of innovation ecosystems. While the notion of an innovation ecosystem is now being adopted by governments, there is, as yet, limited debate in academic circles as to the implications of an innovation "system" versus an innovation "ecosystem". However, the implication is that an innovation ecosystem is so complex that it cannot possibly be entirely governed by policy-making. The term "ecosystem" implies something more organic and self-regulated (bottom-up governance) while perhaps the word "system" implies something more regulated (top-down policy-making). The UK Government acknowledges that design forms part of the UK innovation ecosystem: "The UK innovation ecosystem contains deep and varied capabilities in science and technology, creativity and design" (Department for Business, Innovation and Skills, 2011, p. 46).

As academic interest in design as a driver of innovation began to grow, in the late 2000s, researchers adapted systems failure theory to provide an economic rationale for integrating design into innovation policy. The terminology has evolved from "Design Infrastructures" (Love, 2007) to "National Design Systems" (Moultrie and Livesey, 2009; Raulik-Murphy and Cawood, 2009; Sun, 2010; Swann, 2010; Hobday *et al.*, 2012; Whicher and Cawood, 2012) to "Design Ecosystems" (Ministry of Employment and the Economy, 2013; Chisolm *et al.*, 2013; Whicher, 2016). Finland was the first country to adopt the concept of a National Innovation System to inform innovation policy in 1992 (Sharif, 2006) and it was also the first country to adopt the concept of a Design Ecosystem to inform design policy in 2013 (Ministry of Employment and Economy, 2013). The concept of NIS is rooted in theory and has been tested and validated by academic and policy communities around the world. Design researchers have sought to transpose theory on NIS to justify policy intervention for design (Raulik-Murphy, 2010):

> By applying theory from National Innovation Systems, the notion of National Design Systems transfers established theory to the design domain and advocates that it could enable researchers to better inform policy-making by identifying insufficient interaction between stakeholders, which may be contributing to the limited use of design resources in national economies.

Table 2. Components of Design Ecosystem models

	Private sector	Public sector	General public	Design support	Design promotion	Design centres	Design associations	Design sector	Education	Research	Funding	Government
Love (2007)	•			•	•	•		•	•	•	•	•
Moultrie and Livesey (2009)	•							•	•	•		•
Raulik-Murphy and Cawood (2009)				•	•		•		•	•	•	•
Sun (2010)	•	•			•		•	•	•			•
Ministry of Employment and the Economy (2013)	•	•	•		•	•			•	•	•	•

Although theory on Design Ecosystems is gaining traction within policy and academic circles, the concept has been subject to limited testing. By deconstructing the constituent elements in the various Design Ecosystem models (see Table 2) they have been examined to reconstruct a Design Ecosystem as a framework for testing and validating.

Love (2007) identifies 24 sub-system elements of "National Design Infrastructures", Moultrie and Livesey (2009) depict five agents within a simplified "National Design System", Raulik-Murphy and Cawood (2009) offer a comprehensive model with seven drivers, Sun (2010) also identifies seven components – some overlapping. The Finnish Ministry of Economy's Design Ecosystem is composed of nine elements and was the only model to include the general public as design users. There is a high degree of commonality between components of the different ecosystems – companies, education, research, promotion and government are frequently cited as core elements. Raulik-Murphy and Cawood as well as Sun offer comprehensive models; however, both overlook components identified by the other. For example, the Raulik-Murphy and Cawood model excludes the professional design sector itself as well as design users, which are core components included by Sun. Alternatively Sun, excludes funding sources and design support that are integral to the Raulik-Murphy and Cawood model. The implications being that by modelling Design Ecosystems, investigating the interactions between components of the systems, researchers and policy-makers can assess the performance of a Design Ecosystem and propose policy actions. According to the Finnish Ministry of Employment and the Economy (2013, p. 12):

> *Design competence will be promoted by enhancing the activities of the design ecosystem. The aim is to strengthen all aspects of the design ecosystem in order for them to speed up one another's growth and lead to a greater competence in design in general.*

In essence, by modelling the dynamics of a Design Ecosystem policy-makers can assess the influence of design on innovation performance and identify effective targets for government investment and intervention.

Method

Although the concept of Design Ecosystems is gaining traction within policy and academic circles, it has been subject to limited testing. There is no common model for policy-makers and researchers to analyse a Design Ecosystem and compare it against other countries. The aim of this research was to co-create a Design Ecosystem model with stakeholders that could inform policy-making and enabling international benchmarking. Design is about jointly developing solutions with users as such the participation of core stakeholders including policy-makers, academics and design centre managers were an essential part of the research. Design itself is a method for engaging diverse stakeholders in a consensus building process. The "Double Diamond" is frequently adopted by practitioners as a framework for design activities but more and more, it is being used by academics as a design research framework. The Double Diamond (Design Council, 2007) is an iterative process involving divergent and convergent thinking (see Figure 1). The four phases – Discover, Define, Develop, Deliver – prescribe scoping, user needs analysis, data collection, and refinement stages. The Double Diamond was adopted in order to perform research for design by design.

To operationalise the Double Diamond as a research framework various tasks and methods can be allocated to the four segments. For the purposes of creating a common Design Ecosystem model, the following four tasks were performed:

(i) Discover – Perform a systemic review of the literature on Design Ecosystems.
(ii) Define – Conduct interviews with policy-makers (n8) in four countries to understand their needs.
(iii) Develop – Test the Design Ecosystem model in a workshop with policy-makers, academics and design centre managers (n25).
(iv) Deliver– Refine the Design Ecosystem model in a peer review process in a workshop with policy-makers, academics and design centre managers (n25).

Firstly, based on a systemic literature review, the aforementioned Design Ecosystem models were com-

bined to create an initial model for testing. The first iteration of the Design Ecosystem model was based on the following nine components:

(i) Design users (private sector, public sector and general public)
(ii) Design support
(iii) Design promotion
(iv) Design agents (centres, associations, networks and clusters)
(v) Professional design sector
(vi) Design education
(vii) Research and knowledge exchange
(viii) Funding
(ix) Policy, governance and regulation

A fundamental step in the design research framework is in understanding user needs. In the case of using the Design Ecosystem model to inform policy development, the ultimate beneficiaries of the research were intended to be policy-makers. As such, semi-structured, face-to-face interviews were conducted with eight policy-makers in the national ministry for economy (or equivalent) in Denmark, Estonia, Finland and the UK. The interviews were conducted between May and August 2012. Estonia and the UK were selected because they had design well integrated into national innovation policy and Denmark and Finland were selected because at the time they were preparing national design action plans. The questions focused on the barriers and opportunities to developing design policy as well as what insight into the Design Ecosystem policy-makers required to inform evidence-based policy-making. This constituted a user needs analysis to understand government requirements for the Design Ecosystem model and design policy.

Consequently, a workshop was held in Cardiff in June 2012 as part of the SEE Platform to test the Design Ecosystem model involving 24 people including ten policy-makers, six academics and eight design centre managers from nine EU countries. As part of the workshop a visualisation of the nine components of the Design Ecosystem was created on A1 posters as a mapping tool. In small groups, the participants performed three exercises. The first involved mapping the actors and initiatives for each of the nine components in their country. Second, the participants identified the strengths and weaknesses of each of the

Figure 1. The Double Diamond as a research framework.

elements. Thirdly, the delegates co-created a set of policy actions to capitalise on the strengths of the Design Ecosystem and tackle the weaknesses. Each group then presented their findings to the other participants, which constituted an informal benchmarking exercise to share good practices between countries.

The participants used the data generated from the mapping exercise to justify government intervention to stimulate aspects of the Design Ecosystem. This was performed over the course of the three-year EU project with additional empirical data collated through the Design Policy Monitor. As a result of advocacy, additional research and workshops, the partnership integrated design into 18 policies and 48 programmes at regional and national levels. At the end of the project, a final workshop was held in September 2014 in Jyväskylä in Finland with 25 participants including ten policy-makers, eight academics and seven design centre managers. The purpose of this workshop was to further deconstruct, reconstruct, refine and validate the Design Ecosystem model. The workshop involved debate in small groups and collectively to explore how the Design Ecosystem construct was useful and what could be improved. Through a consensus building process, the participants presenting government, academia and design centres consolidated the components of the Design Ecosystem model.

Findings

The findings from this research focused both on the output (the consolidated Design Ecosystem model endorsed by policy-makers, academics and design centre managers) as well as the process (actively involving core stakeholders in a consensus building process). Both of these aspects, the output and the process will be discussed in turn hereafter. Innovation ecosystems have now become the framework of analysis for policy-makers and academics to assess the innovation performance of a country or region to inform evidence-based policy. Since the late 2000s, a growing community of academics have asserted that policy intervention for design can also be justified by systems failure theory (Love, 2007; Moultrie and Livesey, 2009; Raulik-Murphy and Cawood, 2009; Sun, 2010; Swann, 2010; Hobday *et al*., 2012; Whicher and Cawood, 2012; Chisolm *et al*., 2013). However, within these models, design appears to operate outside the main innovation ecosystem. It is necessary to embed design within the innovation framework of analysis by considering the Design Ecosystem as part of the Innovation Ecosystem. The first iteration of the Design Ecosystem was developed based on the literature. To analyse user needs, policy-makers were interviewed to understand what evidence they require to inform policy. The model was tested in a workshop where stakeholders mapped the actors and initiatives and subsequently the strengths and weaknesses of the Design Ecosystem in their country. Based on the strengths and weaknesses, the participants co-created a set of policy proposals to stimulate the supply of and demand for design. The model was subsequently refined in a consensus-building process at a later workshop. According to one government participant, "We found the methodology for the workshop a really useful way of gaining
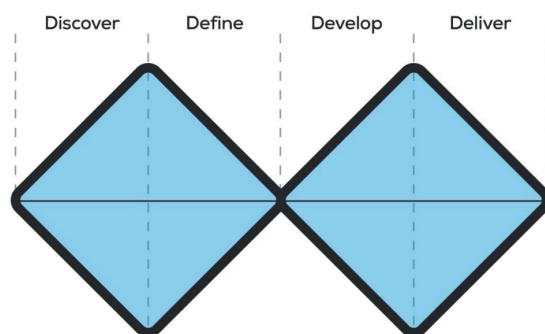
insight into design for innovation in other countries". For another policy-maker "The creative techniques used in the session were a really productive approach to delving into the details of the Design Ecosystem".

The feedback from the first workshop was that the Design Ecosystem was a useful construct for understanding how prominently design features within the Innovation Ecosystem in a country. Some policy-makers were surprised by the number of existing actors and initiatives in operation when conducting the mapping of the Design Ecosystem. The mapping tool proved useful for demonstrating the critical mass and scope of the Design Ecosystem. At the outset, the most important component was felt to be design users as these were identified as the ultimate beneficiaries of design expertise. However, as discussions progressed it became clear to participants that every element of the Design Ecosystem was interdependent and that supply and demand had to be in equilibrium. For example, if design is not part of the education curriculum in primary and secondary schools good design will not be an attribute valued by future business leaders so affecting the future demand for design. Similarly, low take-up of design in a country is not a challenge that can be tackled by one element of the ecosystem alone; it requires coordination across multiple dimensions of the ecosystem. According to the Innovation Union Scoreboard the "most innovative countries have balanced innovation systems with strengths in all dimensions" (European Commission, 2014, p. 12). This logic can be extended to the Design Ecosystems – design intensive countries have a balanced Design Ecosystem with strengths in all dimensions. A balance between supply and demand is one of the most fundamental concepts in economics and by identifying imbalances in the Design Ecosystem, government can implement policies to stimulate greater demand for or supply of design expertise to enhance the overall productivity of the Innovation Ecosystem. The Design Innovation Ecosystem model advocates that all the components are mutually reinforcing and a policy should consider every aspect of the ecosystem to ensure a balance between supply and demand.

Based on the feedback from the second workshop it was necessary to "strip the model back to the essentials". This involved simplifying some of the components to single terms. For example, for the component "design users", it was recommended that the qualifying description of private sector, public sector and general public be dropped. Similarly, it was proposed that the element "design agents" be revised to "design actors", which was more in-keeping with government terminology and the added descriptions of centres, associations, networks and clusters were cut. The simplification of the components was justified by the need to provide guidance on what to include when mapping the Design Ecosystem and that clarifications would be provided. The component "design users" refers to the extent to which the private and public sectors use design is a measure of a country's design capability. Participants recognised that while public and private organisations may be using design they were perhaps not using it to its full potential. The component "design support" refers to what support is available to enterprises (and the public sector) to use design. Design support programmes

are a policy instrument for improving innovation and design use through mentoring and coaching. Many such programmes exist across Europe funded by national and regional government. Some programmes focus on providing light touch mentoring to large number of companies while other programmes provide more strategic inventions over a longer period of time to support companies to take an idea all the way to market. Design promotion refers to conducting activities to raise awareness and understanding of design among different target audiences through initiatives such as design weeks, biennales or festivals, design awards, exhibitions, conferences, design museums, publicity and public awareness campaigns among others. For example, participants stated that there were many design promotion activities taking place in their countries but they were not connecting to the appropriate audiences such as through business associations, chambers of commerce, science parks and incubators.

Design education is crucial for ensuring the supply of quality designers from primary and secondary school to undergraduate degree level. Design education does not have to be limited to individuals training to be designers. The most progressive universities across Europe are integrating multidisciplinary education into the business curriculums. This is why education is relevant to both the supply and demand sides of the Design Ecosystem because it is creating an appetite for and appreciation of good design among future business leaders. To advance design as an academic discipline, the practice of design within the professional design sector and the use of design by industry we need to advance design research and knowledge exchange. Developing new research to support the field and diffusing knowledge between academia to industry, public sector and society is a crucial aspect of the Design Ecosystem. Many respondents asserted that design research was one of the weakest components of their Design Ecosystem.

Funding is one of the prime policy instruments for governments to incentivise innovation; however, design is often excluded from mainstream innovation financing. Participants stated that there are an increasing number of innovation vouchers, subsidies, grants and tax credits available in Europe and but that design is not often eligibility within such mechanisms yet it can be an accessible approach for small companies to innovate. Where design is included in innovation funding it is often "hidden" within the eligibility criteria and therefore there is low take-up of design within innovation financing programmes. The component "design policy" refers to government intervention aimed at stimulating the supply of and demand for design to tackle the failures and capitalise on the strengths of the Design Ecosystem. Design policy can be both explicit and tacit. Explicit policies for design refer to countries where design is officially integrated into national policy (this could be innovation policy, smart specialisation strategies, other policy domains or even a dedicated design policy) while tacit design policies refer to countries with government-funded design policy mechanisms (this could be design support programmes, design promotion activities or design centres). Reassuringly, the participants felt that the model with nine components provided a comprehensive depiction of a Design Ecosystem. By having representa-
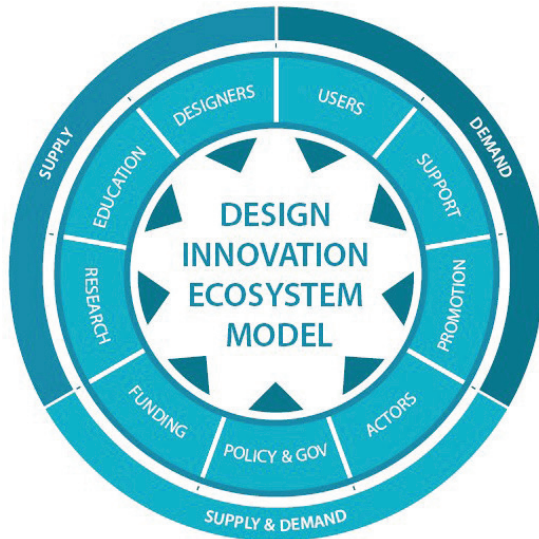
Figure 2. Design-driven Innovation Ecosystem Model.

tives from government, design centres and academia, the participants were able to build a shared understanding of needs from three divergent perspectives. Through an iterative process of harmonising and synthesising the diverse perspectives a general consensus was reached by the workshop participants on the components of the Design Ecosystem (see Figure 2).

The Design Ecosystem model proved a useful framework for policy-makers to analyse the contribution of design to innovation. According to one of the Finnish policy-makers:

> The Design Ecosystem highlights very well our thinking. Ecosystem is something very much used in innovation discussions and with our design policy we tried to strengthen our Design Ecosystem and make it more dynamic.

The Design Ecosystem constructed also resonated with one of the Estonian policy-makers who asserted that it was useful because it captures a broader approach "not just a single dimension of design". For the Danish policy-maker who stated that their design policy is in its "fourth generation", whereas earlier policies had focused heavily on the demand side, they have now recognised a need to focus on the supply side again and the Design Ecosystem presents a "balance between these two sides". When asked about what insight was useful for policy-making, one of the UK policy-makers stated that benchmarking is a dominant approach to informing policy and that the Design Ecosystem model could be used as a framework for "qualitative, quantitative as well as informal benchmarking". This mean that the mapping exercise constituted qualitative benchmarking while a number of indicators could be allocated to make a quantitative assessment of an Ecosystem and furthermore that an exchange of experience (like at the workshop) amounted to an informal benchmarking process. By involving a range of stakeholders from governments across Europe the consolidated Design Ecosystem model was endorsed by its intended beneficiaries.

Adopting the Double Diamond as a design research framework created a number of opportunities. First and foremost, it involved the primary end-users at multiple stages of the research process; as such policy-makers gained a tangible understanding of design methods and the added value of a design approach. Secondly, it effectively constituted a continuous peer-review process and long-term consensus building process legitimising the findings and ensuring that the outputs corresponded to user needs. The Double Diamond can be operationalised as a framework for academic research by assigning objectives and methods to the four phases or eight quadrants as necessary. The four phases – Discover, Define, Develop, Deliver – prescribe scoping, user needs analysis, data collection, and refinement stages. The Double Diamond was adopted in order to perform research for design by design.

The Double Diamond approach involved the intense collaboration by the primary end-users – innovation policy-makers, academics and design centre managers – at multiple stages of the research process; as such policy-makers gained a tangible understanding of design methods and the added value of a design approach. Design can be a difficult concept for policy-makers to grasp without examples. Fundamentally, the innovation policy-makers were able to experience a design process. In many other research frameworks participants are passive whereas in the design research process the participants were able to "learn by doing" and experience a design process first hand. The hands-on working methods were instrumental in creating a shared understanding of the policy constraints and facilitating constructive dialogue to co-create solutions. At the outset, the three user groups could be considered as having little overlap of expectations and understanding of the positions of the other stakeholders on the role of design in innovation policy. Gradually over the course of the process, they converged on a common understanding. In effect, this research has built a cohort of over 30 people representing government, academia and design centres across nine countries with a shared understanding of the opportunities and barriers of integrating design into innovation policy. Many members of this cohort then became champions for design-driven innovation within their own countries. The Double Diamond enabled an effective consensus-building process over the course of three years in an applied, real-life context. Validity can be achieved by jointly developing research with stakeholders and so integrating peer review into the development and testing phases and in effect creating cohort of advocates so contributing to endorsement and legitimacy.

Conclusion

Innovation ecosystems have now become the framework of analysis for policy-makers and academics to assess the innovation performance of a country or region to inform evidence-based policy. With the growing interest in design as a driver of innovation, there was an opportunity to create a common model for to examine a country's Design Ecosystem to inform policy development. A design process was used as a framework to

conduct this research – in essence, research for design by design. By adopting the Double Diamond as a design research framework, this research has resulted in a Design Ecosystem model, jointly developed and endorsed by the primary user groups – innovation policy-makers, academics and design centre managers across nine European countries. As part of the consensus building process, a consolidated Design Ecosystem model with nine components was co-created: (1) users, (2) support, (3) promotion, (4) actors, (5) designers, (6) education, (7) research, (8), funding and (9) policy. Each element of the ecosystem is interdependent meaning that a policy should consider every aspect of the ecosystem to ensure a balance between supply of and demand for design expertise. By mapping the actors and initiatives and strengths and weaknesses of a Design Ecosystem, stakeholders can identify insufficient performance and jointly develop policy proposals to capitalise on the strengths and tackle the weaknesses. The research process demonstrated that design itself is an effective approach for synthesising the diverse perspectives of multiple stakeholders. In sum, the process created policy for design by design. There is an opportunity to promote the Design Ecosystem construct in order to support governments across Europe and even around the world in developing targeted policies for design. In May 2016, the process was adapted to inform policy development in Lithuania. As part of the Design for Europe initiative, PDR delivered a workshop involving a cross section of stakeholders representing government, the innovation agency, design, business and academia to co-create a set of policy proposals to better support design in Lithuania (Design for Europe, 2016b).

References

BORRAS, S. 2003. *The Innovation Policy of the European Union from Government to Governance*. Cheltenham, Edward Elgar Publishing Limited, 256 p.

CHISOLM, J.; MORTATI, M.; VILLARI, B. 2013. *DeEP Glossary. Describing the system of European Design Policy*. Report. European Commission by the Design in European Policy project, 22 p.

DEPARTMENT FOR BUSINESS, INNOVATION AND SKILLS. 2011. *Innovation and Research Strategy for Growth*. London, Department for Business, Innovation and Skills, 104 p.

DESIGN COUNCIL. 2007. *Eleven lessons: managing design in eleven global companies*. London, Design Council Report, 144 p.

DESIGN FOR EUROPE. 2016a. Evidence-based policy for design in Ireland. Impact Case Study. Available at: http://designforeurope.eu/news-opinion/evidence-based-policy-design-ireland. Accessed on: 17/08/2016.

DESIGN FOR EUROPE. 2016b. Developing a Design Action Plan for Lithuania. Available at: http://designforeurope.eu/news-opinion/developing-design-action-plan-lithuania Accessed on: 17/08/2016.

ESTONIAN MINISTRY OF EDUCATION AND RESEARCH. 2014. *Knowledge-based Estonia. Estonian R&D and Innovation Strategy 2014-2020*. Tallinn, Research and Development Council, 19 p.

EUROPEAN COMMISSION. 2013. *Implementing an Action Plan for Design-driven Innovation in Europe*. SWD(2013)380. Brussels, European Commission, 12 p.

EUROPEAN COMMISSION. 2014. *Innovation Union Scoreboard 2014*. Brussels. Directorate General for Enterprise and Industry, 100 p.

MINISTRY OF EMPLOYMENT AND THE ECONOMY. 2013. *Design Finland Programme. Proposals for Strategy and Actions*. Helsinki, Ministry of Employment and the Economy, 54 p.

FREEMAN, C. 2004. Technological infrastructure and international competitiveness. *Industrial and Corporate Change*, **13**(3):541-569.
https://doi.org/10.1093/icc/dth022

FREEMAN, C. 1995. The "National System of Innovation" in historical perspective. *Cambridge Journal of Economics*, **19**(1):5-24.

HOBDAY, M.; BODDINGTON, A.; GRANTHAM, A. 2012. Policies for design and policies for innovation: Contrasting perspectives and remaining challenges. *Technovation*, **32**:272-281.
https://doi.org/10.1016/j.technovation.2011.12.002

IRISH GOVERNMENT DEPARTMENT FOR JOBS, ENTERPRISE AND INNOVATION. 2016. *Action Plan for Jobs 2016*. Dublin, DJEI, 133 p.

LOVE, T. 2007. National Design Infrastructures: The Key to Design-driven Socio-economic Outcomes and Innovative Knowledge Economies. *In:* International Association of Societies of Design Research Conference, 2007, Hong Kong. *Proceedings…* Hong Kong, p. 1-22.

LUNDVALL, B.-Å. 1985. *Product Innovation and User-Producer Interaction*. Aalborg, Aalborg University Press, 39 p.

LUNDVALL, B.-Å. 1992. *National Systems of Innovation*. London, Pinter Publishing, 342 p.

MOULTRIE, J.; LIVESEY, F. 2009. *International Design Scoreboard – Initial indicators of international design capabilities*. Cambridge, Design Management Group, Institute for Manufacturing, University of Cambridge, 90 p.

POLISH MINISTRY OF REGIONAL DEVELOPMENT. 2007. *Operational Programme Innovative Economy 2007-2013*. Warsaw, Ministry of Regional Development, 192 p.

PROINNO EUROPE. 2011. *Innovating Innovation Policy*. Newsletter. Berlin, Issue 6, Oct.

RAULIK-MURPHY, G.; CAWOOD, G. 2009. National Design Systems – A Tool for Policy-making. *In:* Research Seminar – Creative industries and regional policies: making place and giving space, 2009, Birmingham. *Proceedings…* University of Birmingham, p. 1-13.

RAULIK-MURPHY, G. 2010. *National Design Systems*. SEE Bulletin. Issue 4, Oct., PDR Cardiff Metropolitan University, p. 10-11.

SHARIF, N. 2006. Emergence and development of the National Innovation Systems concept. *Research Policy*, **35**:745-766.
https://doi.org/10.1016/j.respol.2006.04.001

SUN, Q. 2010. Design Industries and Policies in the UK and China: A Comparison. *Design Management Review*, **21**(4):70-77.
https://doi.org/10.1111/j.1948-7169.2010.00097.x

SWANN, P. 2010. The economic rationale for a national design policy. London, BIS Occasional Paper 2, 69 p.

VON HIPPEL, E. 2005. *Democratizing Innovation: The evolving phenomenon of user innovation*. Cambridge, MA, MIT Press, 204 p.

WHICHER, A.; CAWOOD, G. 2012. *European Design Systems and Innovation Policy*. SEE Policy Booklet 5. PDR Cardiff Metropolitan University, 16 p.

WHICHER, A. 2016. *Benchmarking Design for Innovation Policy in Europe*. Cardiff, Wales. PhD Thesis. Cardiff Metropolitan University, 369 p. Available at: http://pdronline.co.uk/blog/2016/08/a-new-dr-in-pdrs-ranks. Accessed on: 20/08/2016.