

Desarrollo de métodos y herramientas para la industria del envasado: el papel mediador y facilitador del diseño en el fomento de la innovación en contextos complejos

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Resumen: El envase es un artefacto complejo: es un objeto de uso y un dispositivo de comunicación. Se ha convertido en una interfaz para el consumo y en un importante elemento mediador que activa procesos de contacto entre diferentes actores y contextos. Dada la naturaleza polifacética del objeto y la complejidad de su cadena de suministro, la innovación en packaging concierne no sólo a la dimensión productiva y tecnológica del contenedor, sino también a las necesidades del producto, los diferentes requisitos de los actores de la cadena de suministro, las expectativas de los usuarios y, más en general, las responsabilidades para con la sociedad y el medio ambiente. Todos estos factores se entrecruzan a través del envase, formando una verdadera “plataforma de innovación”. A través de un proyecto desarrollado en la Universidad de Bolonia, destinado a elaborar directrices para el diseño de envases con vistas a prevenir y facilitar los procesos de reciclado, esta contribución propone reflexionar sobre el papel del diseño a la hora de mediar y facilitar los procesos de innovación mediante la creación de métodos y herramientas específicos para un sector especialmente complejo y articulado como el de los envases.

Palabras clave: Envase - packaging - innovación - reciclado

[Resúmenes en inglés y portugués en las páginas 71-72]

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Developing Methods and Tools for the Packaging Industry: The Mediating and Facilitating Role of Design in Fostering Innovation in Complex Contexts

1. Design as Mediator in Packaging Design

Among the objects of our everyday life, packaging is perhaps among those that are present in our lives in a more pervasive way: it is the result of an industrial production process, but also an expression of contemporary culture. Packaging is a complex artefact that has considerably expanded its functions over time (Bucchetti, 1999; 2005; Ciravegna, 2010; 2017): first of all, it is an object of use, which allows, in the stages following production, to protect the content, preserve it, transport it, etc.; moreover, in consumption contexts, it facilitates the physical interaction of the user with the content and with the container itself (for dispensing, handling, processing, etc.). It is, however, also a communication device (Bucchetti & Ciravegna, 2009), which ensures that the product emerges from the shelf and attracts the attention of the potential buyers in order to induce them to purchase, narrates brand values, conveys relevant information such as the expiry date or the composition of the contents, guides its use or disposal through appropriate instructions for use, and so on. Beyond its being a container and a means of communication channel, packaging is metaphorically a 'bridge', as it fosters contact between subjects and contexts that are also distant from each other (Chiarenza & Formati, 2022) temporally and geographically (for example, it acts as a link between places and moments of production with those

of consumption) or creates a relationship –rational and emotional– between the brand storytelling and its target audience. But it is also an interface for the information dissemination, thanks to which end-users can make conscious choices (Bucchetti, 2007) regarding the purchase and use of products (e.g. facilitation of opening and access to content), as well as their end-of-life management.

Due to its multifaceted nature, designing packaging requires different skills and the intervention of multiple disciplines: for this reason, it should be understood as the result of an integrated set of choices made by a plurality of actors, where each plays a specific role, direct or indirect, in its definition. The group of such actors, who play a role in the definition of packaging, and the relationships (e.g. exchange of information) established among them to design, produce and manage it throughout its life cycle constitute the so-called ‘packaging system’ (Ciravegna, 2010; 2017; Bucchetti & Ciravegna, 2009; Mauri, 1996).

Compared to other sectors, the packaging supply chain is, however, fragmented in time and space; in other words, the design process underlying the development of packaging is generated by a series of successive and incremental interventions with different times, ways and purposes. Within this framework, design reconfirms its important directorial and mediating role (Celaschi, 2008a; 2008b), as it gives shape, through design synthesis, to packaging solutions that are an expression of the confluence of the needs of all the actors involved and the multiple functions of the artefact, connecting the communicative dimension to the more strictly instrumental one.

Innovation in packaging, in this sense, does not only concern the productive and technological dimension of the container (Lydekaityte & Tambo, 2020) (as, for example, in the case of evolved packaging systems or smart packaging), but becomes pivotal within a creative process that leads towards solutions that respond to the requirements of the product, to the different needs of the players in the supply chain, to the expectations of users, and more generally to responsibilities towards society and the environment. Packaging, therefore, can be read in a dual perspective: as an object, but also as a ‘platform’ of innovation, through which production constraints, market trends and dynamics, emerging technologies, social instances, sustainability and circularity intersect.

2. Methods and Tools to Support Innovation in the Packaging System

In the field of design, the term ‘Advanced Design’ (Celaschi et al., 2019; Celaschi, 2016; Celaschi & Celi, 2015; Celi, 2015; Iñiguez Flores et al., 2014) is an articulated system of design practices applied to processes, products or services, in complex scenarios projected into the future. It is based on a systemic approach that makes use of collaborative activities (Zamenopoulos & Alexiou, 2018) among multiple actors to drive changes within the realities in which it operates and outline possible futures to move towards, from a perspective of anticipation. Another fundamental aspect of Advanced Design is the approach known as ‘extreme design’ (Celaschi & Celi, 2015), which involves the transfer of innovation from contexts that are geographically or culturally very distant from those of the project itself. It is in this specific context of design research that the ‘Osservatorio Innovazione

Packaging' (Packaging Innovation Observatory) was created, developed by the Advanced Design Unit (ADU) of the Department of Architecture of the University of Bologna, with the aim of monitoring and fostering the development of innovation in a highly complex sector such as packaging (Giardina & Celaschi, 2020). Through the collection and systematisation of information inherent to the packaging sector, the Observatory investigates, maps, interprets and narrates innovation related to the packaging sector, using a design-driven approach and drawing on knowledge and expertise from different scientific and technological disciplines (Giardina, 2024). Furthermore, it facilitates collaborative projects of responsible innovation (Succini, 2023; Jakobsen, Fløysand & Overton, 2019; Gianni, Pearson & Reber, 2019; Blok & Lemmens, 2015; Stilgoe, Owen & Macnaghten, 2013; Owen et al., 2013).

The Packaging Innovation Observatory (<https://adu.unibo.it/osservatoriopack/>) engages in several activities, employing various tools and operational methods. Firstly, the Observatory constantly monitors the sector (Pletto, 2023) through the collection, selection and cataloguing of cases of interest. These cases are not limited to packaging but include materials, logistical solutions, communication projects and digital technologies. The cases are then fed into a searchable and continuously updated database, where they are filed according to a system of tags describing the elements of innovation that determine the creation of value ('value drivers'). Furthermore, it gathers substantial insights by observing trends and analysing significant documentation (scientific publications, technical reports, podcasts, videos, etc.) related to packaging design and other related areas. It then develops studies and applied research projects on specific product categories or on cross-sectoral topics. Finally, it organises dissemination events, such as seminars and co-creation workshops, to promote and facilitate networking and cooperation between stakeholders.

Although the Observatory's approach is based on objective and measurable data, it does not aim to quantify phenomena statistically. Instead, it makes qualitative and narrative elements prevalent. The goal is to undertake a multidimensional analysis, employing conceptual grids and tools defined according to specific needs.

The Observatory is a tool, with its own working method, designed to support innovation in the sector. Still, it is also a generator of new tools and methods to tackle the analysis of specific fields, product categories, themes. It is, in this sense, a virtuous example of how the contribution that design can make to innovation processes is not limited to the realisation of new products or their semi-finished products, but also extends to the development of methods and tools to support companies and designers, characterised by different purposes. The latter may be: 1) operational, i.e. supporting the design choices of a working group for the development of a specific solution; 2) analytical and interpretative, i.e. oriented towards a reading of the state of the art or a verification of the design choices made; 3) collaborative, i.e. with the aim of networking multiple actors in order to generate participative and cooperative processes.

Here are some examples: the definition of procedures and artefacts useful for carrying out field surveys or conducting tests on samples of users, the organisation of co-creation workshops and participatory processes, the development of analytical grids and critical reading keys for processing and systematising collected documentation, the development

of editorial tools for control and application (e.g. checklists and guidelines) or more complex systems, integrated with interactive digital platforms, for verification and validation (such as evaluation software).

3. Design Guidelines: An Example of a Tool for the Packaging Industry

Among the most recent collaborations developed by the Observatory with relevant players in the packaging supply chain in Italy is the one with 'CONAI-Consortio Nazionale Imballaggi' ('National Packaging Consortium') (<https://www.conai.org/>), a private non-profit organisation that represents in Italy the means by which packaging producers and users ensure the achievement of the recycling and recovery targets for packaging waste set by law. In addition to the companies responsible for the production and use of packaging, the consortium system involves a wide range of actors in the supply chain, including public administrations, which set the rules for waste management in the area, and citizens, who play a crucial role in this process through the daily practice of waste sorting.

In the context of the 'Pensare Futuro' project (<https://www.conai.org/prevenzione-eco-design/pensare-futuro/>), through which CONAI aims to promote a culture of prevention with an orientation towards circular design in the packaging industry, the Observatory was commissioned to carry out research to draw up 'Linee guida per la facilitazione delle attività di riciclo degli imballaggi in acciaio' ('Guidelines for facilitating the recycling of steel packaging'), a set of recommendations for companies and industrial designers on how packaging solutions - in this case, specifically steel, since further guidelines have been developed by other Italian universities for other material chains (see <https://www.progettarericiclo.com/>) - to ensure greater recyclability and easier end-of-life management.

These guidelines were developed according to a work programme in two phases: the first was dedicated to desk-type activities, with research and analysis of relevant documentation on the steel packaging sector for a qualitative analysis of the issue; the second, to field-type activities, with field research and visits to key players in the steel supply chain for direct observation of processes and collection of input from stakeholders.

During the first phase, sector studies, technical reports, Italian and European reference regulations, articles from the trade press and radio and television, and other useful material selected from online archives and blogs were collected and analysed to provide an accurate overview of the state of the art of steel packaging recycling.

In addition to CONAI, other Italian organisations in the packaging sector also played a key role in the project, offering technical advice and useful documentation. These are 'RICREA-Consortio Nazionale per il Riciclo e il Recupero degli Imballaggi in Acciaio' ('National Consortium for the Recycling and Recovery of Steel Packaging')(<https://www.consorzioricrea.org/>), the association 'ANFIMA-Associazione dei Fabbrikanti di Imballaggi Metallici e Affini' ('Association of Metal and Allied Packaging Manufacturers')(<https://anfima.it/>) and the association 'FIRI-Federazione Italiana Rigeneratori Imballaggi' ('Italian Packaging Regenerators Federation')(<https://www.associazionefiri.it/>).

The collection and systematisation of data examined steel packaging and, more generally, metal packaging, its properties, and values. A selection of cases of interest, considered significant with reference to specific elements of innovation in terms of recyclability and environmental impact, was analysed according to design-driven interpretations. As a favourite criterion for qualitative selection, the cases were identified from an observation of national and international awards and competitions, both specific to the packaging domain and more general to design. To these application cases were added the cases already listed and available in the digital archive of the Observatory that offered interesting solutions for the investigation, also out of the domain.

A survey was also developed and sent to ANFIMA member companies. The primary goal of this tool was to gather detailed information to clearly outline both the opportunities and constraints that characterise the production context. This approach aims to provide a comprehensive view of the limits within which innovations can be introduced, thus enabling the formulation of design recommendations that are pragmatically aligned with the capabilities and boundaries of existing production processes.

The second phase, on the other hand, was focused on field research activities that made it possible to collect relevant feedback and insights directly from the players in the recycling chain of steel containers for domestic and industrial use. In addition to the support of CONAI, it was possible to count on the cooperation of RICREA, which facilitated the arrangement of interviews and visits to some plants in northern Italy. In particular, it was possible to observe some of the firms that make up the entire recycling chain, specifically a company that deals with the collection and first sorting of differentiated material at city collection points; a converter, which produces, by specific treatments, a high quality recycled material, containing an almost monomaterial waste, with percentages of around 98%; a smelter, which mainly uses recycled materials and ferrous scrap as a raw material; companies specialised in the collection and treatment of hazardous packaging and regeneration of packaging for industrial use. These activities made it possible to consider the technical constraints of the processes observed and the needs of each player in the chain. The systematisation and integration of the results of the desk and field research activities thus made it possible to present, within the guidelines, a comprehensive overview of current steel packaging, including the characteristics of the contents and their containers, an analysis of the different categories and formats available on the market, as well as an evaluation of the material production and the complete recycling process, including collection, separation, treatment and casting. In addition, due to the material's nature, an in-depth study was conducted on dangerous packaging and remanufacturing industrial packaging. Finally, design recommendations were provided to assist designers and manufacturers in integrating solutions to improve product recyclability, together with a checklist to identify products in need of improvement in terms of recyclability.

Conclusions

This paper seeks to highlight the mediating and facilitating role of design in favouring innovation processes not only through the improvement of packaging as an object of use and a communication tool, but as a facilitator. This reflection has been carried out through the analysis of the project led by the 'Osservatorio Innovazione Packaging' (Packaging Innovation Observatory) of the Advanced Design Unit (ADU) of the University of Bologna, aimed at developing guidelines for the design of packaging with a view to prevent and encourage recycling processes.

Through the creation process of dedicated methods and tools it is possible to understand the complexity of a particularly articulated and multi-actor sector such as packaging, favouring collaborative processes within it, and thus responding in a systemic manner to the needs of users and players in the supply chain, production constraints, market trends and dynamics, the potential of emerging technologies, social demands, and the imperatives defined by sustainability and circularity.

To be seen as an emblematic case, the guidelines presented constitute a tool 'designed to design', according to an anticipatory logic. They can be considered as 'meta-design device', as a set of principles and procedures to be followed during the design process to foster innovation in a responsible and systemic key, providing a structure and guidance for companies and designers, supporting them in making informed decisions and maintaining consistency and cohesion in their work. They provide a knowledge base and best practices that can be used as a starting point to explore new ideas and develop innovative solutions. The guidelines provide designers with an understanding of the challenges and opportunities present in the specific context of their project, guiding them in the process of idea generation, evaluation, and decision-making. Furthermore, the participatory construction of the guidelines themselves can provide an opportunity for exchange and collaboration among different actors involved in the design and production chain, enabling a better interpretation and alignment of the objectives and expectations of all stakeholders.

This not only fosters product innovation, but also contributes to the promotion of more sustainable practices and the reduction of the overall environmental impact. This approach is therefore crucial in addressing current and future challenges related to responsible resource management and environmental sustainability.

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Abstract: Packaging is a complex artefact: it is an object of use and a communication device. It has become an interface for consumption and an important mediating element that activates contact processes between different actors and contexts. Given the multifaceted nature of the object and the complexity of its supply chain, innovating packaging concerns not only the productive and technological dimension of the container, but also the needs of the product, the different requirements of the actors in the supply chain, the expectations of users and, more generally, the responsibilities towards society and the environment. All these factors intersect through packaging, forming a true 'innovation platform'. Through a project developed at the University of Bologna, aimed at developing guidelines for the design of packaging with a view to preventing and facilitating recycling processes, this contribution proposes to reflect on the role of design in mediating and facilitating innovation processes through the creation of specific methods and tools for a particularly complex and articulated sector such as packaging.

Keywords: Container - packaging - innovation - recycling

Resumo: A embalagem é um artefacto complexo: é um objeto de utilização e um dispositivo de comunicação. Tornou-se uma interface para o consumo e um importante elemento mediador que ativa processos de contacto entre diferentes actores e contextos. Dada a natureza multifacetada do objeto e a complexidade da sua cadeia de abastecimento, inovar a embalagem diz respeito não só à dimensão produtiva e tecnológica do recipiente, mas também às necessidades do produto, às diferentes exigências dos intervenientes na cadeia de abastecimento, às expectativas dos utilizadores e, de um modo mais geral, às

responsabilidades para com a sociedade e o ambiente. Todos estes factores se cruzam através da embalagem, formando uma verdadeira “plataforma de inovação”. Através de um projeto desenvolvido na Universidade de Bolonha, destinado a desenvolver directrizes para o design de embalagens com vista a prevenir e facilitar os processos de reciclagem, esta contribuição propõe-se refletir sobre o papel do design na mediação e facilitação dos processos de inovação através da criação de métodos e ferramentas específicos para um sector particularmente complexo e articulado como o das embalagens.

Palavras-chave: Recipiente - embalagem - inovação - reciclagem

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