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Trends and strategies in design driven innovation

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设计驱动创新中的趋势与策略

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If we look back at the relatively short history of design as a discipline, we can easily see that it is mainly aimed at innovation. In the decades, innovation through design has been addressed toward a variety of different directions, starting from the renewal of forms of material products so make them more desirable and rich of sensorial qualities. For several decades starting from the so called “industrial revolution”, back to the middle of Nineteenth century, following the example of applied artists such as William Morris, designers worked so to improve the external appearance of pieces of furniture and other objects used in daily activities, so to give poetical and visual attributes to the artefacts produced in series. The history of the rapid evolution of styles and aesthetic values in the last two centuries can be depicted through the analysis of the changes in for of these objects. More recently, Design has been engaged in other challenges related to innovation: the growing relevance of services and of product & service systems in our times opened new opportunities to designers and made them facing new challenges, and needing new knowledge and skills.

During the last three decades, the blooming of digital technologies has been inducing great changes in people behaviours, needs and ambitions. The development of
internet and mobile technologies changed the way people communicate, access to information, the trading systems, the decision process in purchase, the activities of studying and working. Still, digital technologies offer great opportunities to innovate different industrial sector: from furniture to wearable devices, and to the creation of smart physical environments, both indoor and outdoor, so to support more sustainable and gratifying ways of life.

Innovation is a key-factor for companies and industries: it is mandatory to compete in the market, to maintain an effective relationship with customers and to improve reputation over time. Furthermore, today innovation must be intended as an effort to invent and make attractive new life styles and production systems more efficient in terms of energy consumption and with more positive impacts on local environments and life quality.

If we focus on digital technologies, we can easily understand that they can give great contributions to the innovation of a very vast variety of fields. I list here only a few examples. The development of new communication tools and the availability of information offer immense chances to improve and extend education and culture; furthermore, they offer commercial opportunities making easy the interaction at the distance and support the visibility of large and small companies; digital communication reduces times of trade, allows co-design activities and distributed production processes. In domestic environments, digital technologies allow the creation of more safe and efficient habitats, also supporting the autonomy of people with disabilities or other health problems. Electronic technologies are amply employed in every field of transportation and allow the design of more efficient, safe and comfortable auto-vehicles.

Without going through the innumerable ways in which digital technologies can give an innovative contribution, we can say that they can improve the quality of the every day life of individuals, groups and minorities; they can sustain new organization systems in work places; they enables convenient / positive social behaviours (co-operation and solidarity) and offers alternative solutions to systemic problems such as mobility, waste disposal, energy savings.

On the other hand, today, the development of innovative products, based on interactive technologies requires specific knowledge and skills and faces a number of challenges that should be treated with a dedicated approach.

We can list the main issues involved in the design of interactive solutions in terms of:

- aesthetics of interaction and dynamic experiences;
- modelling of cognitive and emotional processes governing the user experience;
- multidisciplinary co-design;

In the following of this paper, I'll enter in more detail in each of these topics.

For decades, designers mainly focused on the forms of material objects and physical environments in order to produce visual and sensorial beauty and add value from the aesthetic and symbolic points of view. Designers have been working on their technical ability and on their personal sensitiveness so to produce artefacts able to elicit emotions and pleasure in users. To cope with digital technologies, designers face the challenge to elicit emotions and pleasure and to create meaningful and engaging experiences through the design of immaterial solutions and this is quite a new adventure.

In the use of a smart device, such as a smartphone, a pair of interactive glasses, a smart watch, a digital app or any kind of service, or else of a video-game or any other kind of interactive entertainment, the final user perception is only partially influenced by the visual or physical factors such as the shape of the device or the graphical interface. Instead, the dynamics of action-reaction and the flow of activities supported by technologies are much more relevant and they give form to the tangle of cognitive and emotional processes in which the user is involved.

In other words, designers working on interactive solutions must learn how to create beautiful experiences acting in the domain of time in the same way they have been working in the three dimensions of the physical space, and they must learn how to produce positive and meaningful dialogues between humans and machines using factors such as rhythms and principles of causality. Beyond the aesthetics of objects, we must focus on the aesthetics of the actions and activities, and learn how to elicit meaningful behaviours and gratifying gestures mediated by technology.

To achieve this result designers must master more complex and articulated models of human mind, understand more deeply and clearly how emotions are generated and how they interweave with every action and activity; designers must study and internalize new knowledge produced by scientists of the brain sciences such as Daniel Kahneman, the winner of a Nobel prize, who divulged his theories about fast and slow thinking.
activities. Designers must extend their knowledge about perception phenomena and social attitudes that in the past were mainly devoted to visual effects, and focus on the domain of interactive solutions where the final perception of harmony, good gestalt, common face, grouping and prominence can be produced acting on multi-sensory effects and on cause-effects principles.

Finally, we must consider the importance of a multi-disciplinary approach in the project of an interactive product or service. The rapid evolution and the intrinsic complexity of electronics and computer sciences makes quite hard if not impossible for designers to achieve a complete knowledge and control of limits and potentialities of digital technologies. Furthermore, technologies in this field evolve at a very high speed making impossible a complete mastering of all the opportunities offered by the inventions produced by engineers. On the other hand, it is always more evident that very seldom technical innovation on its own produces a real progress for final users: innovation in technology becomes progress only if and when if its outcomes are convenient for the communities and desirable for individuals. Quite often, in the development of a digital service or product, designers still play a secondary role, and are mainly involved in the creation of physical appearance of interfaces and devices, so giving a sort of "cosmetic" and limited contribution. This approach is one of the main reasons for the failure of a high number of projects that appeared convenient and appealing from functional point of view during design, but that did not match the demand in the market.

In the design of an interactive product or service, we actually design a two-component system: one part is a technological machine and the other is the human being that uses the machine to achieve personal goals and perform tasks and activities. For this reason, the role of designers is crucial and central to fully take into account users needs, of their wishes, attitudes, potentials. Most effective digital solutions come out of a co-creation process involving experts of several different disciplines: engineering, product and interface design, marketing, economics.

Designers bring their knowledge of human perspectives and perception and they can orient the contribution of other experts in the project through the creation
Its own produces a users; innovation in progress only if and to be convenient for the able for individuals. Development of a digital designers still play a re mainly involved in the appearance of giving a sort of there is contribution. This main reason for the sort of projects that end appealing from v during design, but stand in the market. Interactive product or go a two-component technological machine man being that uses personal goals and ties. For this reason, social and central to users needs, of their ties. Most effective out of a co-creation of several differenting, product and ng, economics. Their knowledge of ad perception and contribution of other through the creation of suitable representations apt to clarify the physical and virtual components of the artefacts from the real beginning of the project process. Designers should assume a more central role in multidisciplinary project team since, due to their knowledge of human perception and of emotions, they should be considered as applied anthropologists, able to sense the final attitude of users toward the technological devices and services. In the new world that we are building, based on a mix of digital and physical experiences, designers should be considered as the architects of the virtual dimensions and lead the project of innovative solutions so to focus the attention of all the actors toward the users satisfaction.

To achieve this result, designers must widen their capability to create representations so to make visible the main elements of the user experience beyond the physical characteristics of material products and devices. In other words, designers involved in the design of interactive solutions must be able to prefigure and illustrate the most relevant factors of the interactive use of a product or service in a similar way as they represent the material form of not-yet existing material objects so to lead and orient the subsequent phases of implementation.

Following this approach, at Politecnico di Milano, we are working to the development of innovative products and systems based on digital technologies. We work in tight cooperation with engineers and other experts of electronics and telecommunication technologies at the JOLLY- Joint Open Lab, a multidisciplinary project laboratory founded in a cooperation agreement between the university and Telecom Italia.

We are now working to the design of smart solutions and products coherently with the paradigms of Internet of things and we are now focused on the incoming EXPO event next year in Milan.

We aim to use digital technologies to improve the experience of visitors during the fair and to exploit the potentialities of local contexts through the development of dedicated apps. We want to bring technologies in real life and in physical environments such as public and private spaces so to support daily activities such as getting information, planning transportation and mobility, and shopping. In domestic environments we are re-designing traditional
appliances such as lamps and pieces of furniture, so to make them more interactive and playful. Finally, we are engaged in the design of application accessible through the use of wearable devices and we are investigating the complex issues related to the acceptability and to the physical and cognitive ergonomic characteristics of the most innovative devices.

In order to orient the activities of the designers and of all the experts of technology involved in the project, we produce video-scenarios describing the user experience and we begin to do so in the first phases of the project process, when the functional features of the project are outlined in more detail, we produce further video-scenarios to guide the execution of the final product.

I do believe in the importance of investing in communication during each phase of the project and, following Kim Erwin, I do believe that the only innovation is worthwhile to invest on, is the one we can communicate.

I want to tell you about social driving innovation. First, we all know, in all the companies and society, that the innovation is a necessary and important thing. So, we can see, the changes and the economy are not changing. We must consider innovation is an important factor for the whole market complete. And, it is also an important factor for the whole economy and society. Today, we can see how many factors are increasing. Additionally, we can see how many factors are increasing in this project. Today, we can see how many factors are increasing in this project.
技术，现在已经呈现一个爆炸性的增长。我可以看到以前的演唱会可以只是此时此刻的一个场景。但是现在是实现了真实的虚拟的无限的连接，我们在任何时候都可以享受到最先进的技术和体现。所以，这个就是我们面临的改变。技术创新的改革能够让我们思考哪些问题？我们首先需要考虑这个创新，它必须持续不断地能够促进和改善我们的日常生活，能够让每个人的生活变得更好，也能够改变社会，不管是多数人还是少数人的生活都变得更好。并且能够促进社会的组织系统，使社会的积极活跃地发展。同时，也能够为那些系统性的问题，比如说移动，或者说能源的方面提供一些新的解决方案。当然，现在我们不仅是一个技术的创新，我们要考虑到这些技术的创新必须产生一些新的意义和价值。而且在技术创新方面我们必须要加上理解、审美和新创意的要素，从而影响用户的体验。我们可以看到，不仅仅是有数码的产品，有些很重要就是说用户体验。比如说用户的界面，我们平时用的数码产品的界面，它是否可以让我们设计和我们的活动很好地组织起来呢？

在这个时代，我们必须要做好具体和数字空间的建筑设计，也就是说我们看到很多新的建筑。看到了很多新的空间。那么这些新的空间也能够为我们新的数码产品的设计提供新的灵感。同时，设计师也必须要负责道德规范和审美提升部分。那么现在，有很多创新的项目都需要多个利益相关人和多学科进行共同的合作。比如，设计产品的设计师，包括设计的经理，或者说各个不同的设计专家，有不同的学科和不同的利益相关人进行共同合作。通过这样的协同也会有更广更广的能力来吸引技术服务，我们把它叫作共同的开放实验室。这样的一个实验室，它是一个智能的，社会的空间实验室，这里面有很多的电脑，设计师和工作人员会共同地合作，来共同地解决智能社会的问题。通过各个方面的不同的合作也会有更大的影响力。我们会看到，这些设计师这样的一些融合，能够让每一个设计师有更多的互动，并且能够对审美，对实际的使用，对人们的体验的期待会有更高更深的理解。

简答地说一下我们现在正在做的一些项目。你们知道，明年在米兰我们非常荣幸能够主办下一届的世博会。所以，这是一个很好的一个盛会，会有非常多的国家来参加这个世博会。也会在这个世博会中展现他们最新的技术，想法和观点。所以这是一个很大的设计的一个盛会。可以说包含很多著名设计师的想法，我们会有很多的公司进行合作，设计了非常多的数码解决方案。提供给米兰的世博会，比如说会有谷歌眼镜等来融合，比如说我们的米兰让游客更加地方便了解，不仅仅给他们一些历史的介绍和指导，或者说不仅仅提供他们可以购买，还会提供很多关于这个知名景点的介绍，同时也能够让他们对知名但是有趣的地方有更多的认识。同时，我们现在还有很多互动的项目。
比如说我们国家对我们产品的质量要求是非常高的。在我们的设计当中，我们也会聚焦于高品质产品这一概念，那么高品质产品这一理念，我们如何把它融合到数码产品当中来，我们会把这个理念以数码的方式介绍给大家。比如说这个产品是原材料，整个产品的制造的过程，并且在传统产品的特色方面，我们也会进一步地强调，会对这些信息进行具体的介绍，所以能够提升所有游客对我们产品的认识和关注。除此之外，我们在出版方面，或者说是文学选题方面也提供了一些自己的改进。比如说有很多人他们每天都看着这个互联网，每天都看着自己的手机。好像大家觉得纸质的书会消失，是这样子吗？我觉得不是的，我们现在正在做一个项目，能够让纸质的书跟数码产品融合起来，就是把物质和非物质的联合的价值变得最大化，并且使整体的学术环境和文学环境得到进一步的丰富和充实，所以，比如说像这样一个文学的咖啡馆中，我们可以看到，人们可以自己看纸质的书，同时也可以通过数码的或者是新的设备和方式，来参加一些文学或者是其他方面的比赛，通过这样的方式提供氛围。我们可以看到，在家居的设计方面也有很多的创新，我们知道家居的整体设计和氛围是每个人都非常关注的，在我们家居设计的想法中，我们要考虑到怎么样设计一些传统的家居，使它们更加地有互动性。比如说台灯，它可以携带信息，甚至是可以在用户互动玩耍。所以说，通过这样一个创新设计的产品，也是一个创新的途径，我们也希望，在这个智能的系统当中，能够建立一个基于人类和科技之间的对话案例的互动想法，因为这不仅仅是一个一个可用性的原则，不仅仅是时间，不仅仅是关于统计或者是不仅仅是关于一个区域，而是把所有的大的数据结合起来，然后设计出超越可用性原则的产品。当我们重新设计这些互动性产品和服务的时候，必须要从一个可用性原则转换到互动美学的原则，从便捷美学到摩菲（同音）美学的改变。比如说所有的产品它们的用户体验是怎么样的，我们能够让智能的物品变得更有趣味。我们看到，在这个设计师和建筑设计师之间，这并不是说仅仅这两个部分就可以达到我们的目标，因为这是需要各个利益相关人来共同努力和协同创新的部分。因为我们非常关注沟通和交流，因为我们每天都说这个交流的作用对我们是至关重要的。而且这个交流的过程也影响我们提供的产品和服务。所以我想，我们大部分的设计师，大家也不想在设计中扮演次要的角色。所以每个人都有自己的主动性和自己的审美观。我们必须要让设计师能够表达他们自己的想法，而在这个技术发明之前，大家就能够把自己的想法表达出来。

总结一下，我们也可以看到创新，它需要很多共同同时存在的因素，第一个是信任，第二个是认知，第三个就是理解。具体来说，就是共同的互信的信任，第二个是说对现在所有的机会和所处的一
创新的过程中，我们深刻理解，能够取得创新成果的不仅仅是技术的革新，更在于系统化的方法和实践。在这个过程中，我们需要做一些非常深刻的认知。那么这第三理解是包括我们最新的创新理念是需要我们不断地学习和接受的，因为创新需要大量的理解和系统性的东西。每个人都需要理解他们的优势在哪里。他们的问题在哪里，才能够更好地创新。在每一个创新中都会有一些摩擦。我们必须要投入更多的时间作为沟通和交流，才能够更好地理解。为了处理这样一个摩擦的状况。我们就必须考虑到很多的方面。我们必须要使用各种交流的工具，比如说一些视频的方案或者是录音的方案。能够使这些视频方案把它做出来作为用户的体验。他们可以使用未来的一个产品和服务更加的配套化。也可以使用视频这个方案，还需要一个好的方案。能够体现出大家的智慧。大家的想法。大家不同的的情绪。都可以通过录像的方式能够记录下来。也要考虑到我们一定要使用什么样的工具和设备。那么就通过各个方式。比如说最新的沟通交流的通讯工具。以及视频方案。我们可以通过一个由数据驱动的知识或者是一些共享的内容的平台。只有通过这样的方式，才可以最终地提升用户的用户体验，并且提升我们的产品和服务。也就是说，值得发展的这样的技术。其实是我们可以沟通交流的创新。所以我觉得我们必须要更深刻地研究我们的文化因素。比如说我们的一些传统，我们的理念。这样才能够让我们的技能也更加的深入，我们必须理解我们的产品和服务，我们希望能够提供全方位综合的一个解决方案。我们的创新必须植根于传统的文化和遗产，同时我们要把虚拟的信息和服务结合起来。我们结合人种志这样的科学的分析结合起来。