Tian Gong Guan: Inspire disruptive innovation thru industrial design thinking

“天公馆”工业化设计思维激发颠覆式创新

On the first floor of the office building of Corporate Technology (CT), Siemens Ltd., China (SLC), there is a 60-70m2 painted lab stocked with mobile tables and white boards as well as a variety of prototypes made with paper or lego, cardboards full of post-its and pictures from field research. Named Tian Gong Guan -Innovator’s Heaven in Chinese, which is the home to the Integrated and Disruptive Innovation Center (IDIC), a group within the technology field Systems Engineering. Here, two full-time trainer/coaches devote themselves to arranging and organizing tailored curriculums and workshops for various research and development (R&D) teams from CT and Siemens Business Unitis from all Sectors for innovations with disruptive potential.

Founded in January 2012, IDIC is aimed to train innovators for “user need-driven technology innovation” with out-of-the-box thinking.

Dr. Arding Hsu, Senior Vice President of SLC and Head of CT in China, who has worked in the United States for many years, has long recognized that research-driven innovation as commonly practiced in developed countries should not be the major approach in China.

In the Chinese market, the most powerful innovation asset is a large number of user needs,” said Hsu. “So, the most effective approach for technical innovation in China is to guide researchers to go in the field and identify hidden market needs.” We call that “customer need-driven innovation”. This also fits very much to the thinking of Chinese R&D teams who are, e.g., better at visual thinking than peers from other cultures, and to the habit of Chinese engineers, e.g. “I’ll only believe it when I see it” when it comes to practicing prototyping, while achieving faster delivery to market and lowering costs.

It is based on such a philosophy that IDIC came into being and embraced Design Thinking, which is an innovation methodology originated from Stanford University. Different from the research-driven method, which starts with defining the technical problem, it starts with digging into the needs to be addressed and satisfying user needs by integrating multiple technologies or businesses through iterations of needfinding, brainstorming, prototyping, and user testing to come out with “not-me-too” ideas. In this process i.DT – Industrial DesignThinking in China, researchers specialized in their specific

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在西门子中国研究院的办公楼一层，有一间六、七十平米的彩色工房，里面挂着花花绿绿的图表，摆放着各种模型、沙盘和手工制品。它中文名叫“天工馆”，是系统工程技术领域下“集成与颠覆性创新中心”的驻扎地。两位专职教练在这里为来自中国研究院和西门子业务集团的研发团队安排和组织量身订制的个性化课程，以发展具有颠覆性潜力的创新。

“天工馆”创建于 2012 年 1 月，其目的是培训创新者跳出框框看问题，发展具有颠覆性潜力的“用户需求推动型创新”。

在美国工作多年的西门子中国研究院院长徐亚丁博士深谙，在中国搞研发，不能照搬发达国家常用的“研究驱动的创新”模式。

“然而，在中国市场上，我们应该认识到，最强大的创新资产是大量的用户需求，”徐亚丁说。“因此，在中国搞技术创新，最有效的思路是引导研发人员从市场的需要出发，发现并满足潜在的用户需求，用切实的需求推动创新。”我们称之为“需求推动型创新”。“需求推动型创新”也适应中国式的思维习惯，符合中国研发团队更为擅长的形象思维，满足中国工程师们“眼见为实”的习惯对于建模和设计原型的要求，同时加快创新进入市场的速度并节约成本。

disciplines are exposed to other different technology fields and are able to learn and “steal” across disciplines, and even team up to yield better outcomes.

“To give an example, a user would want a better driller. To meet the need, in a conventional way, it’s all about improving the quality and performance of the mechanics, e.g. drilling bits. However, following the i.DT way, you might get to know that the user needs to drill holes in the wall using the driller, the reason behind which is probably to hang something on the wall in order to decorate the room, and ultimately the user’s need is actually to have a comfortable room. By asking ' why ' s step by step, the real needs of the user unfold, and the solution addressing user’s need may have nothing to do with driller. In this way, you could be more creatively pulsed to come up with more innovative solutions,” Hsu said.

At the busy CT, Tian Gong Guan is a refreshing place for R&D teams using i.DT to work on real projects for need-driven innovations. For instance, in a project aiming to achieve precise energy distribution in a building through mobile location and human-computer interaction, the IT team members worked in Tian Gong Guan where they had a lot of dynamic discussions with a lot of paper cards as mobile interface simulation – which is the so-called “low-resolution prototype” that enables visualization and materialize object-based communication between the researchers, as well as supports an efficient and cost-saving R&D process. A brainstorming session focusing on end-users of the building captured various unusual but wonderful ideas which contributed to the final solution – a personalized precise energy allocation solution. Different from conventional centralized control system, the system controls environmental parameters based on environmental preferences of end-users of the building, improving user comfort and reducing energy consumption.

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在这一背景下，引入“设计思维”的“天工馆”应运而生。源于斯坦福大学的设计思维是一种方法论，它颠覆了以技术难题为出发点的创新，而是从深入发掘用户需求出发，整合多种技术和商业模式来满足用户需求，其间通过多次迭代的需求分析、头脑风暴、建立模型和用户测试反馈等，迅速产生具有独特卖点的创新成果，并且使得原本精通于特定工业领域的纵向发展的研究员，能够通过洞察多学科的技术和商业应用，横向沟通、整合、创新。

“比如，用户要求一个更好的钻孔机，为了满足用户，传统的方式是专注于优化钻机和钻头。但是，如果我们问为什么用户需要钻孔机，答案是需要在墙上钻孔。如果我们再进一步，问为什么需要在墙上钻孔，答案是需要在墙上挂东西。更进一步，在墙上挂东西的原因是需要装饰房间。最终，我们了解用户的真实需求是舒适的房间。通过这一连串的 ' 为什么 ' 我们可以深入挖掘用户的真实需求。了解真实需求后，可能最终满足用户的解决方案根本不需要钻孔机。这样可以更好地启发研发者的思路，开发更多不同寻常的创新方案。”徐亚丁说。

“天工馆”建立以来，这个在严肃的研究院里让人耳目一新的小清新“教室”成了研发团队运用设计思维开展头脑风暴，取得面向需求的创新成果的新天地。在一个旨在通过手机定位和人机交互实现楼宇内能源精确控制的项目中，研究院的信息技术团队在“天工馆”一边讨论，一边制作了大量模拟手机界面的纸质卡片，即所谓的“低解析度原型”，让研究人员之间的交流在实物的基础上更加直观和顺畅，也由此支撑了“短、平、快”和成本节约型的研发进程。从智能楼宇最终用户的角度展开的头脑风暴中，各式各样离奇而并非不切实际的可能性被及时发现，为研发打开了思路。最终，一套不同于传统的集中控制方式的，基于楼宇最终用户个人的环境偏好来控制环境参数的“个性化精确能源分配楼宇控制系统”被开发出来，提高用户的舒适度并降低能源消耗。

“天工馆”里摆放的一个蚁穴模型和一个矿工假人，是专注于射频识别技术的团队开发矿工随身携带的井下定位装置的道具。蚂蚁作为经常发生“矿难”的物种，是这个项目的“极端用户”。蚁穴模拟的是矿工的工作环境，假人身上佩戴着矿工下井时的全部装备。通过围绕道具展开的观察和讨论，研发团队发现曾经困扰他们的定位设备的耗电量对于矿工头灯的电池而言不值一提，从而及时扭转了不必要的研究方向，并进而开发出“工业无

In Tian Gong Guan, there is an ant farm model - a miner persona, props for the RFID team to develop portable downhole locators for miners. In the project, ants are taken as the “extreme users” that is highly prone to “mine accidents”. The ant farm simulates working conditions of miners, and the persona is fully equipped like a real-world miner. Through observation and discussion around the props, the team found that a cap lamp battery uses negligible amount of power. It was a surprising discovery as they have been plagued with the issue of locator power consumption. Based on the findings, they pulled out promptly from unnecessary work and turned to a more imperative research, and developed the Industrial WLAN module platform that not only meets mining applications but also provides a new paradigm of business cooperation with system integrators.

In another example, the medical imaging team, who, under the guidance of i.DT methodology, collected extensive industry information and inputs from doctors, patients and even those who have nothing to do with the project but are physically healthy and very concerned about health – such as moms with new-borns. Based on the research, they found a breakthrough to urinary sediment analyzer development.

According to Hsu, i.DT guides researchers to track all kinds of needs, a very important part of which is the need of extreme users, so as to uncover hidden needs that are usually not easy to find out with typical users. To do this, comprehensive information collection advocated by i.DT is very important Hsu is proud that CT has adopted Design Thinking and turns it into “Industrial DesignThinking in China” in order to fit the industrial environments in China for China, instead of indiscriminately introducing it from Stanford. “In China, our R&D is subject to constraints related to time, resource, budget and output. So we need to adapt Design Thinking to Chinese characteristics, so as to bring the world-leading methodology into full play,” Hsu said.

According to Xiao Ge, an i.DT trainer/coach from IDIC at Tian Gong Guan, the increasing recognition of IDIC and the lab has proved the credibility of i.DT in real industrial projects in China. The mechanical engineer graduate from Stanford University says her efforts have paid off seeing her CT colleagues benefit in Tian Gong Guan.

“I would have accepted such training at any cost, even a pay cut, if I had a chance to do so when I were young,” said Hsu. “In the workplace, nothing is more valuable than an opportunity to learn something new and valuable.”

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线局域网的模块平台”，不仅满足了矿业领域应用，并创造了与系统集成商的全新业务合作模式。再比如，医学成像团队在设计思维的指导下，广泛收集行业信息，听取医疗人员和患者的意见，甚至采访与项目毫不相关的那些健康的但对健康非常关注的人士——比如婴孩的妈妈，从而在尿沉渣分析仪的开发上找到了一条新路。

徐亚丁说，设计思维引导研发人员全面地关注各种需求，其中非常重要的一部分就是极端用户的需求，从而保证设计尽可能地实现最广泛的覆盖，而“天工馆”所引导的全面信息的收集是对这一思路的有力支撑。

令徐亚丁感到骄傲的是，中国研究院在引入设计思维的过程中并非照搬斯坦福大学的成果，而是将其打造成具有本土化特点的“中国工业化设计思维”，从而使之更加适应中国的创新环境和工业环境。“在中国，我们的研发工作有时间的限制，有资源的限制，有预算的限制，有产出的要求，因此我们必须按照中国本土的条件和要求对设计思维的方法论进行因地制宜的调整，让这个世界顶尖的方法成为符合中国特色的做法，更好地为我所用，”徐亚丁说。

毕业于斯坦福大学、目前在“天工馆”担任设计思维教员的葛霄说，“天工馆”越受欢迎，越说明设计思维得到认可和重视，对“需求推动型创新”有助益，她说，每当看到研究院的同事们在“天工馆”有所收获，自己都感到特别快乐和满足。

“假如我年轻的时候有这种新生的理念和事物，即使减我的薪水，挤破脑袋，我也要接受这种培训，”徐亚丁不无感慨地说。“在公司里，没有什么比能够学到新的有价值的东西更为重要的了！”