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The craft of prototyping

O ofício da prototipagem

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Abstract

The ability to prototype, a fundamental know-how in terms of developing innovation through design processes, is widely embedded in Latin countries' indigenous craftsmanship and entrepreneurship, which can be defined as a competitive advantage for exploring local technologies as an exclusive source for the development of innovative solutions with market significance. This study debates the function craft activities can play in the context of global innovation networks.

Key words: prototyping, craftsmanship, innovation, local technology.

Resumo

A habilidade de prototipar, um conhecimento fundamental em termos de inovação por meio de processos de design, é amplamente incorporado na habilidade de artesanato indígena e empreendedorismo de países latinos, que pode ser definida como uma vantagem competitiva para explorar tecnologias locais como uma fonte exclusiva para o desenvolvimento de soluções inovadoras, com significância no mercado. Este estudo debate as funções que atividades artesanais podem desempenhar no contexto de redes de inovação global.

Palavras-chave: prototipagem, artesanato, inovação, tecnologia local.

The function of craftsmanship is evolving in the context of the knowledge economy

There is a growing segment of the global economy that no longer can be defined by the characteristics of industrial production systems because it operates by a different logic and dynamics. While the industrial economy is characterized by the mass production of goods through large-scale manufacturing systems, the so-called knowledge economy is best explained by the interplay of information systems, talent, and ingenuity that, when properly managed, are the originators of novel ideas. Innovation in the form of consumer goods, health care assistance, government services, new manufacturing processes, financial services, social structures, and renewable sources of energy highlights the fact that there is a large sector of the global economy that is primarily regulated by the practice of research and development. However, little is known about how creative activities, such as craftsmanship and design, function in the context of the knowledge economy. For Latin countries such as Portugal, Italy, Brazil, and Mexico, with long traditions in craftsmanship, understanding how creative production systems work and what function craft activities can play is critical for integrating local know-how into global innovation networks.

While research and development (R&D) can be characterized as a universal practice in knowledge economies, the relevance of the ideas it generates is deeply grounded in the natural and social local infrastructure. Consequently, innovation can only be developed if abstract concepts are negotiated within the local infrastructure to give shape to the artifacts, transactions, and rituals in which innovation will play a role. The ingenuity and diversity of craftwork found in Latin countries is a demonstration that ideas are negotiated locally. Such negotiations require a unique skill set, an expertise that is very difficult to notice and even more difficult to describe, because it is tacit knowledge manifested through the daily practice of craft activities.

In the context of industrial production, craft as a skilled activity is mostly defined as a costly and specialized manufacturing process. Craft is costly because productivity is low, and it is specialized because it is difficult to replicate. Consequently, the skill set of making has little or no function in industrial mass production systems. When

craft is defined in relation to industrial production, it is perceived as a dated production system. Such a myopic interpretation gives little attention to the skill set that in R&D plays a key role in creating prototypes, a critical milestone in the development of innovation.

In the context of creative production, competencies embedded in craft activities, which were traditionally deployed in the production of unique and single artifacts, are now fundamental in the prototyping of new archetypes. Craft in R&D is the most qualified practice as far as formulating open-ended experiments that search for solutions that don't exist. Given the high degree of uncertainty involved in creative productions, unique know-how in terms of designing the unknown is an indispensable ability.

Craftsmanship, biotechnology, and innovation in Brazil

Natura, a Brazilian company and brand that produces cosmetics, provides some valuable insights about the function and value of craftsmanship in Latin countries abundant in indigenous ingenuity. Natura (2010) has declared a commitment to product innovation based on the sustainable exploration of the biodiversity found in Brazil's natural resources, as well as new product development processes based on systems of "open innovation," which can be characterized by close collaboration with external partners such as suppliers, researchers, designers, and small local producers.

In 2005 Natura embarked upon an ambitious initiative to open an iconic store in Paris to commercialize a special line of accessories, one of them being an exfoliate soap case made from vegetable brush and vegetable leather. This case (NóDesign, 2010), as described by the Brazilian design firm that developed the product, NóDesign, provides valuable insights regarding the new ways through which a social entrepreneur from the state of Rio de Janeiro organized a craft enterprise in a remote village in the Amazon forest, in the state of Acre, to produce vegetable leather, which was then combined with the expertise of a bioengineer in the state of São Paulo who specialized in producing vegetable brushes. The design of the case was developed by NóDesign, and the assembly was done by families from a farm in São Paulo, supported by a not-for-profit organization devoted to increasing income levels for rural families in Brazil through a sustainable exploration of local natural resources. The final product was then commercialized in a Natura store in Paris.

Examples like Natura challenge the traditional belief that local ingenuity and indigenous craftsmanship are incompatible with design expertise devoted to innovation in large-scale production systems. In addition, it demonstrates that craftsmanship and technology are dependent on each other as far as creating innovation. This new model suggests that there is a very promising future for those who can develop creative productive systems that take advantage of indigenous ingenuity, design expertise, and entrepreneurial global networks. The search for sustainable production systems should alert us to the fact that Latin countries have a long tradition of local craftsmanship, ingenuity, entrepreneurship, and inherited know-how, which can be defined as unique design assets to integrate Latin countries to global innovation systems. Such a tradition provides a unique core competence that takes advantage of opportunities offered to those who can master biotechnology and develop innovative products that can succeed in a socially- and ecologically-conscious marketplace. However, the ability to transfer a core competency in one area to new frontiers depends on the capacity to understand the general principles and key concepts that can describe the design practices, craft activities, and entrepreneurial actions involved in these innovation-driven enterprises.

Design in metropolitan centers is usually known as a technical expertise responsible for the creation of mass-produced products, a definition inherited from the professional practice of industrial design that emerged in synergy with the growth of industrial and urban centers typical of the 20th century. Design in this context is associated with the idea of progress because it embodies the notions of superior quality, technological advancement, and professional expertise. But in villages, design is usually interpreted as arts and crafts activities responsible for the production of utilitarian artifacts needed by a local community, a secular interpretation based on observing indigenous craftsmanship and local ingenuity. The difference between these two definitions demonstrates that indigenous craftsmanship in countries like Brazil has been disregarded as an R&D expertise, alienating local ingenuity from global innovation systems.

The knowledge economy is a global network of local intellectual capital

Given that craft is inherently dependent on the capacity to localize a problem and its solution, craftsmanship is predominantly a context-specific activity deeply attached to the local conditions in which it is performed. Consequently, craft abilities developed in one context are very difficult to transfer and deploy in another context without major re-training.

It can be argued that one of the main barriers for a broader adoption of craftsmanship in R&D is that the understanding of this practice is still obscure, making it difficult to be identified, planned, managed, and transferred. While craftsmanship as a practice might be difficult to codify and understand, conceptually, by its practitioners, in academic discourses there are numerous scholars that have studied this phenomenon. Richard Sennett, a sociologist from New York University and The London School of Economics, is an example of a scholar whose work describes, with unique clarity and precision, the structure of creative practices embedded in craft activities.

According to Sennett (2008), craftsmanship is a practice originated by the operations of positioning a matter in a very specific context (ability to localize), understanding its properties (ability to question), and exploring its potential (ability to open up). He also emphasizes that these operations do not happen sequentially; they are coordinated by the brain as parallel operations processing multiple forms of information. Sennett premises his definition of craftsmanship as a much broader and complex activity than the usual interpretation of the skills involved in manual labor. He argues that craftsmanship is an innate human desire and reflects an ethical value of pursuing excellence through practice.

While it is possible to describe craftsmanship as an abstract operational model, in practice, craft activities are impossible to detach from local infrastructure, including materials, skills, know-how, ethos, and the tacit knowledge accumulated though hours of individual and collective practice. When expertise has limited transferability, its applicability is constrained to the context in which it has relevance. While on one hand this limitation is problematic for applying local expertise more broadly, on the other hand it is a valuable source of knowledge that can only be developed through local expertise. This indigenous ingenuity is the source of unique solutions that emerge from local problems. While problems and indigenous ingenuity are local, solutions can be transferred to new contexts, which then require a different skill set, that of a knowledge broker.

Design as tacit knowledge is accumulated through many years of training and practice and, unlike craftsmanship, it is universal because it can be applied to any context or problem. Design knowledge is fundamentally an expertise in engaging with open-ended problems in order to develop interventions that promote change. Probably one of the best descriptions of this universal practice is Donald Schön's account of what he called reflective practice. Schön (1983) argues that the way practitioners engage with open-ended problems is through an artistic performance, which is an engagement with a particular situation in which a problem and possible interventions are open-ended and yet-to-be-defined throughout the operations of criticism and experimentation. Criticism is the operation through which a practitioner immerses oneself in a situation for the purpose of framing a problem from an endogenous perspective. Experimentation is the operation through which a practitioner goes through non-linear loops of performing focused experiments, generating either promising or discouraging results and networking each of his/her findings. Artistic performance is the sequence of actions executed by experienced practitioners that appears to be simple, spontaneous, and fluid when in reality it is the result of deploying multiple independent but complementary tacit abilities through criticism and experimentation. Schön provides a compelling explanation for the operations through which artistic ways of thinking work as the creative engine of processes that combine research and development.

The universality of design knowledge plays a key function in linking locally-dispersed craft expertise because it can identify, transfer, and adapt endogenous solutions into new contexts and applications. While craft expertise operates locally through the abilities to localize, question, and open innovation, design knowledge functions universally through the operations of criticism, experimentation, and artistic performance. When local craft expertise is properly coordinated with universal design knowledge, a unique, diverse, and dynamic global creative production system emerges because local expertise is connected globally. Design in this scenario plays the function of a knowledge broker, with a fundamental expertise in integrating indigenous ingenuity into global creative production systems by identifying and diffusing solutions that emerge from local problems. However, as knowledge broker, design also has the potential for insight into other problems.

While local problems and their solutions are context specific, R&D activities are linked globally, creating an exclusive worldwide market focusing on innovation. The capacity to transfer local solutions to new contexts through design knowledge creates entrepreneurial networks, which can be defined as borderless enterprises that explore opportunities to innovate. These enterprises connect local craftsmanship, universal design expertise, and a range of entrepreneurs, such as not-for-profit organizations, government agencies, venture capitalists, research institutes and labs, universities, multinational corporations, small and medium enterprises, and co-ops exploring opportunities to benefit from novel ideas (innovation), creating a market for innovation that operates globally by connecting local know-how. When entrepreneurs connect to this creative system, they provide the agency necessary for craftsman and designers to network, creating a global economic sector exclusively dedicated to the R&D of innovation. Understanding how this network functions and the operations through which craftsmen, designers, and entrepreneurs trade expertise and ideas can provide valuable insights for envisioning more productive knowledge creation systems in Latin countries where craftsmanship is very rich but undermined in the context of industrial production systems.

Creative production systems relies on prototyping to develop innovation

Given the high degree of uncertainty and unknown variables involved in designing innovation and increasing demand for alternative solutions in public and private sectors, prototyping has been used in creative production systems in very effective ways as a mechanism linking craft and design activities by combining R&D into one single activity, becoming a valuable expertise for organizations that know how to prototype effectively. While research is usually understood as the initial phase of a two-stage process, followed by the development of a concept/idea, in prototyping, development techniques are the research strategy. In this context, development is research, a know-how that has always been embedded in design and craft practice but seldom trusted because of the lack of scientific rigor and market forecasting precision expected from research activities.

Because innovation involves high degrees of uncertainties and unknowns, the activity of prototyping, meaning research through development, is based on the principle that ideas can be generated with little or incomplete information, which requires know-how to experiment alternatives, usually characterized as prototyping. The ability to prototype has always been integral to craft activities, a fundamental expertise in producing unique and exclusive products. However, in production systems dedicated to manufacturing (craft and industrial manufacturing), the ability to prototype wasn't discriminated from the ability to produce. Consequently, prototyping has always been a hidden capability embedded in craftsmanship. Given the high demand for the ability to research through development in creative production systems, craft is repurposing and retooling its know-how to function in the context of prototyping activities. Craftsmanship in Latin countries could benefit from such changes, but there are still many pending questions regarding the ways in which design, craft, and entrepreneurship can collaborate. Some of the most pressing uncertainties concerned how design expertise in prototyping

can help integrate Latin countries' small-scale indigenous craftsmanship into global production systems. Can Latin countries' indigenous craftsmanship function as a local research and development laboratory for global innovation systems? How would indigenous craftsmen in Latin countries be compensated to their innovative designs/ideas?

Challenges and opportunities for countries rich on craftsmanship

Protecting the Local Intellectual Capital: Indigenous ingenuity, which results from the intersection of craft activities, local infrastructure, and problematic situations, is a local tacit knowledge that can be characterized as a type of intellectual capital with high appreciation in creative systems. However, it is very hard to protect and properly commercialize. Productive systems rich in craftsmanship, such as most Latin nations, are confronted with the dilemma of protecting their intellectual property while engaging with designers and entrepreneurs in global creative systems, which can open the opportunity to reach new markets.

Developing New Local Technologies, Leveraging Local Resources: While problems are locally defined, solutions can be sourced from an exogenous context. The increasing global demand for creative solutions opens the opportunity for entrepreneurs and designers to identify local craft know-how that has the potential to be adapted and augmented for work on new questions, challenges, and solutions. Function as local prototyping labs and small scale production systems connected to a global creative network. Indigenous ingenuity could be the source of new local technologies that could be deployed globally.

Collaborating with Knowledge Brokers: Design expertise has the intrinsic function of being a knowledge broker, connecting local solutions to other local problems. While design expertise is a universal practice detached from any local context, its universality depends on its capacity to connect indigenous ingenuity engaged with context-specific challenges. Being a knowledge broker also involves designing solutions that fit into a local infrastructure (cultural norms, social habits, economic conditions, natural resources), an operation best performed in collaboration with local craft know-how. Consequently, in global creative systems, indigenous ingenuity and knowledge brokers are equally dependent on each other. However, productive models of collaboration between these two agents in Latin countries are limited when compared to the scale and scope of craft activities in these countries. Modeling new collaborative enterprises has the promise of empowering countries rich on craft capabilities and design expertise to shape new models of innovation.

Connecting to Entrepreneurial Networks: Any new collaborative model for innovating through global creative systems needs to appreciate the unique function performed by entrepreneurial networks. Their search for new business opportunities and/or ways of improving people's quality of life generates the market forces that realize the potential value of local solutions with global applicability. While craftsmanship, design expertise, and entrepreneurship are active agents in most Latin countries, only a few regional clusters, like Milan in Italy, have developed an integrated system that coordinates craft, design, and entrepreneurial activities in productive ways to systematically innovate. Although regional clusters are very insightful in terms of extracting models for envisioning creative systems, they are limited in providing a template for modeling such systems in the context of global networks. The new ways that regional clusters are connecting to global creative systems, such as the case of Natura, have the potential to produce new models better aligned with the challenges and opportunities of a knowledge economy that operates in global dimensions.

Becoming a local innovation cluster in the global knowledge economy

While craftsmanship, design expertise, and entrepreneurship are capabilities embedded in most local production systems, their quality and levels of integration are the two variables that differentiate functional from dysfunctional creative systems. In a knowledge economy that operates in global dimensions, both variables are confronted with additional challenges. Quality is no longer measured in a regional context, and integration needs to happen on a much larger scale. However, new opportunities arise in this new context because these local capabilities can now connect to external capabilities that develop global networks of local innovation clusters. Given the know-how of craftsmanship to develop endogenous solutions that are unique and authentic because it emerges from local conditions that are exclusive, every local innovation cluster can be the producer of exclusive solutions that, if properly integrated to global creative networks through the talent of design experts and entrepreneurs, can become valuable intellectual capital. If local innovation clusters are capable of developing, managing, and integrating their intellectual capital in global creative systems, it is likely that the emerging knowledge economy will provide promising new models of production systems that are more ecologically sustainable because of its local knowledge in preserving native resources. This economy will be locally relevant because it responds to endogenous conditions and it will be more sensitive and appreciative of global diversities because it increases the plurality of solutions to be adopted. What remains unknown is the quality and levels of integration that will be achieved by local craftsmanship, universal design expertise, and global entrepreneurship in the context of a global knowledge economy.

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