BUSINESS OPPORTUNITIES FOR CERAMICS IN SMART CITIES

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1. WHY SMART CITIES?

Residential housing has traditionally been the reference market for the ceramic tile sector, but in recent years, new house building has undergone a severe slow-down, dealing a heavy blow to the Spanish ceramic cluster. Today, **internationalisation and the search for new market opportunities are key issues for the ceramics industry**. The urban environment is the current benchmark for the ceramic tile sector and many companies have initiated projects in that field. Indeed, various innovations and products for urban environments have been launched in recent years and are proving to be a successful business line for Spanish companies. **Smart Cities are the new horizon for ceramic companies, which need to be familiar with their prime characteristics in order to create initiative approaches for a new way of conceiving and designing products**, collaborating with partners that enable them to launch successful projects onto the market.

The Smart City concept is still relatively new both internationally and in Spain. In this country, the Spanish Network of Smart Cities (RECI), currently formed by more than sixty cities, is only three years old and the first AENOR publication to set market standards is still in the making. It is, therefore, an emerging concept with a broad scope, the boundaries of which have yet to be defined and where numerous initiatives are still at the planning stage.

Similarly, today we are witnesses to a process of market structuring and regulation as far as smart cities are concerned. This situation represents both a degree of risk, as we do not know the final rules of the game, and an advantage, for those capable of influencing decisions and the future of Smart Cities. Both industry and government administrations currently define what functions, services, technologies and processes Smart Cities will have and how the fabric and dynamics of that market are to be structured.

Smart Cities are fertile ground for innovation, an open space where proposals and categories of products and services are put forward that represent market opportunities for a large number of businesses. But they also pose a conceptual challenge for those companies: what product should we make, what technology should we go for, how should we integrate the Smart concept into our services, and what are the rules of this market (where are the customers, how do we access public tenders, what 'Smart' specifications have to be met, which strategic alliances should we foster, etc.)?

And most importantly for our companies: what role should the ceramics industry play in Smart Cities? The role of traditional industries is to find their place and, in collaboration with other technology companies, to propose solutions that respond to citizens' needs and efficient proposals tailored to the demands of public administrations. City claddings, street furniture, lighting ... are all interfaces in direct contact with citizens and potentially eligible to be equipped with interactive objects and environmental intelligence. Meanwhile, innovations in materials incorporate new features that match current requirements of sustainability and connectivity in the city.

The global Smart City market has forecast annual growth of 14.2% and by 2016, the market is expected to overtake the $1 trillion mark (Source: Markets and Markets). As far as the ceramic tile industry is concerned, the most significant factor is the growth these markets are showing both in building construction and in domestic settings, where the ceramic industry traditionally operates.

2. EXPECTATIONS OF SECTOR PROFESSIONALS IN REGARD TO THE SMART CITY MARKET

In order to ascertain the reality of today's housing sector in terms of its knowledge, expectations and interests regarding Smart Cities, an online survey was carried out, which, by means of a questionnaire, asked professionals from along the entire ceramic value chain, as well as from the related wooden furniture and packaging sectors, about their interest in this market.

The aim was to discover what knowledge they had of companies already working on projects related to Smart Cities, which areas were most appealing to them, what opportunities they have detected or whether they have the necessary partners to compete on this new market.

2.1. SAMPLE GROUP

A total of 67 questionnaires were returned, of which 61% correspond to the sectors under research and therefore the conclusions shown here are drawn from those 41 replies. 87% of the questionnaires finally included in the survey correspond to manufacturers of tiles and special pieces, of furniture, and of frits and glazes, split per sector as shown in the graph (Figure 1).

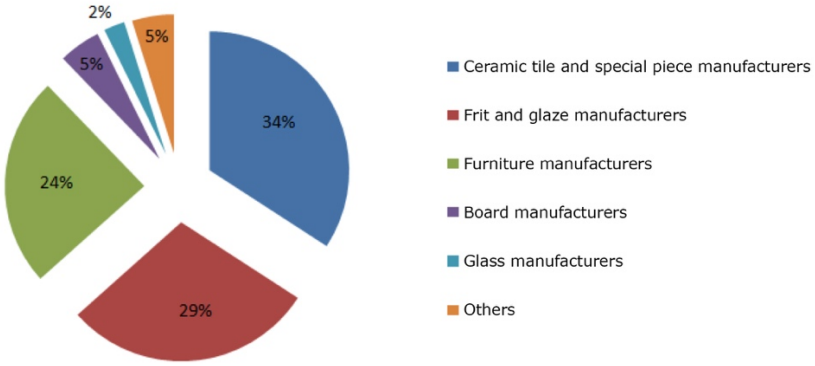


Figure 1. *Respondents' sectors*

Over 70% of respondents have professional profiles related to design, marketing and R&D, which confirms that those profiles are the ones most likely to have knowledge of new markets and new technologies.

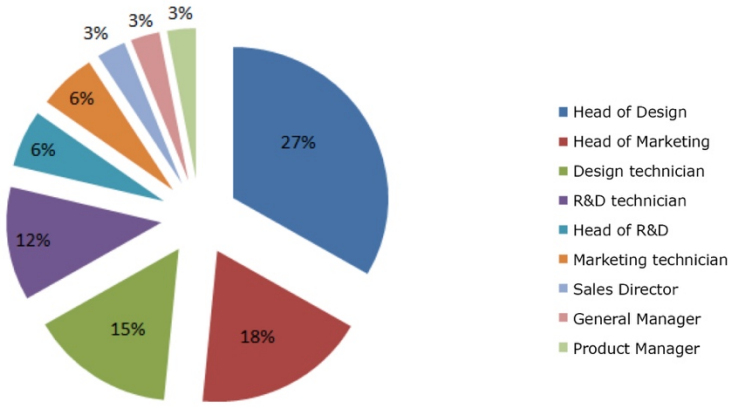


Figure 2. *Respondents' job positions*

2.2. MAIN RESULTS

Who is working in this market? Only 17% of respondents are currently working on projects related to Smart Cities, and 39% say they know of companies in their sector who are working that line of business, especially in the ceramics sector. The most renowned companies named include TAU, Porcelanosa (Urbatek) and Ceracasa.

Does it represent an opportunity? Respondents gave a score of almost 70% to the opportunity presented by this market for the sector they belong to. 54% gave 'opportunity' a score higher than 7 out of 10, while only 7% of respondents rated it at under 5.

Most appealing areas. As shown in the graph (Figure 3), prominent among the areas that seem to be most appealing are firstly Habitability (sanitation, maintenance of parks and urban infrastructure, quality of housing, security, culture, tourism ...) and secondly Energy and Environment (sustainable management of resources such as water and energy, pollution reduction, allergy and weather prediction, etc.).

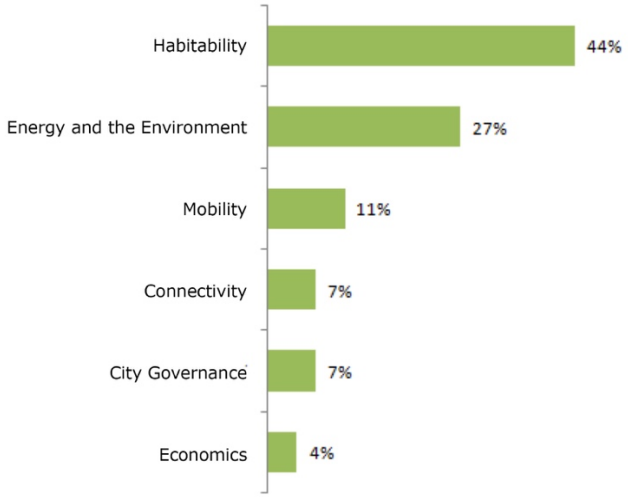


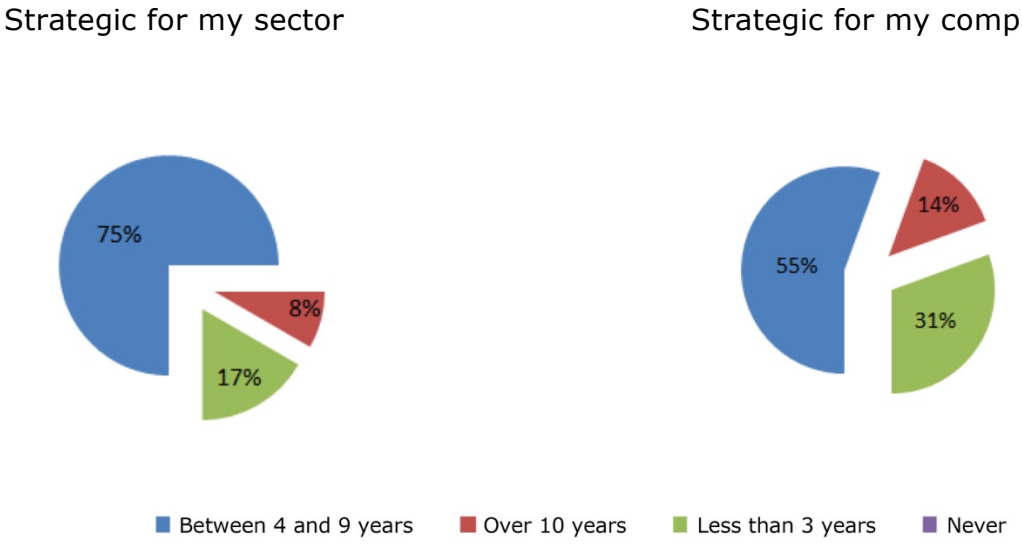
Figure 3. *Most appealing areas for survey respondents*

Difficulties for the ceramics sector. In regard to the main challenges the respondent's company faces to sell products aimed primarily at the Smart City, the most common replies pointed to difficulties with production, profitability and also information. The following table (Figure 4) shows the main hindrances mentioned by the professionals in the survey.

Ignorance of what turnover or profitability it may provide for the company	Cost (production costs, raw materials, use of less polluting materials ...)
Scarce public backing	Competitive disadvantage based on higher costs than the competition
Economic reasons - not feasible for the company	Price
Reasons to do with production capacity	Lack of social demand and awareness
Reasons to do with design	Lack of public funding
Need to invest in R&D	Lack of information (technological, partners, legal ...)
Alliances with other companies	End customer's comprehension
Low commercial demand	Need to establish a sales network

Figure 4. *Main hindrances for entering the Smart City market*

Future interest. In regard to how long it will take the Smart City market to become strategic for companies in their sector, 75% believe that it will take between four to nine years, while 17% reckon that it will occur in less than three years. When the same question is asked in reference to the respondent's own company, the answers reveal an even more short-term focus, given that 31% believe it will become strategic for their company in less than three years (Figure 5).



3. TRENDS IN SMART CITIES AND OPPORTUNITIES FOR CERAMICS

The outline of trends and opportunities presented below is not intended to be state-of-the-art or even exhaustive. What it highlights are some of the opportunities cited by respondents, relating to very specific micro-trends and areas in regard to Smart Cities and urban development.

3.1. AREAS OF OPPORTUNITY

3.1.1. PARKLETS

Parklets are small public spaces for use by local retailers or citizens located in former vehicle parking areas and which can accommodate multiple uses (coffee shops, gardens, playgrounds, lawns, bicycle parking, water fountains, etc.). Some years ago, the city of San Francisco experimented with the installation of a number of parklets that enabled street level initiatives to be carried out in very localised areas.

Figure 6. *Public parklet and parklet for retail use in San Francisco. Photography: Paul Krueger*

This example has inspired other cities around the world and today, the same planning strategy is applied in different countries, although with mixed results.

Opportunities for ceramics:

- Use of materials that provide different features to current materials (heat-absorbing glazes, 'mirror' or reflecting glazes, etc.).
- Creation of street furniture adapted to this new tool using ceramics' inherent quality and durability.
- Inserting radio and Wi-Fi technology into ceramic tiles as a service for eateries and catering businesses.
- New category of outdoor product for the HORECA (HOtel-REstaurant-CAfe) sector.
- Possible combination of materials (wood, ceramics, etc.).
- Concept can be extended to different uses (leisure, garden, outdoor office, bus and tram stops ...).

3.1.2. SMART ROADS

The concept of smart streets or road surfaces arises in response to issues such as sustainable mobility and road safety. Examples include roads that produce electric power from sunlight and are able to channel it into the grid, or roads that predict behaviour by placing sensors that measure, for example, humidity, temperature, stress or vibration.

Sustainability is present in road engineering through a number of projects: lanes for electric vehicles that are recharged with the energy produced by their own movement, road markings using powder paints that charge up with sunlight, intelligent signage that adapts to different circumstances...

Figure 7. *Highway N329 in Oss, Netherlands. Powder paint markings containing luminous particles that use sunlight to charge up during the day.*

The concept of interactivity appears in lighting by building in sensors that incorporate environmental intelligence. On top of that, sustainable systems using wind or solar energy are added.

Opportunities for ceramics:

- Solutions designed to improve road safety.
- Products that include production or service on demand and thus enhance efficiency.
- Inclusion of sustainable light marking systems (photo-luminescence).
- Use of materials that provide different features to those of current materials (heat-absorbing glazes, 'mirror' or reflecting glazes, etc.).
- Products with environmental features;
- Generation of ceramic glazes or inks capable of intercommunicating with citizens, signage, communications…

3.1.3. WALKABILITY

The dominance of the automobile in city centres is being questioned with 're-pedestrianisation' measures that aim to minimise the negative effects of cars, such as pollution, congestion or accidents. A case in point is the pedestrianisation of Times Square, through which more than 400,000 pedestrians transit every day.

Creating itineraries in the city can help to improve pedestrian mobility, thus prioritising quality of life and respect for both the citizen and the environment.

Opportunities for ceramics:

- Taking advantage of urban planning policies that favour pedestrianisation in order to propose products tailored to pedestrians' needs.
- Solutions that minimise the time or distance pedestrians walk in the city because of traffic.
- Designing urban pavement systems that include sensors with which to exploit Big Data.

3.1.4. MATCHING DATA

Urban ornaments and fittings can be turned into smart products that provide information tailored to the needs of each user and remote access to urban management data. Interfaces become an important part of the object, thanks to systems built into other items and objects.

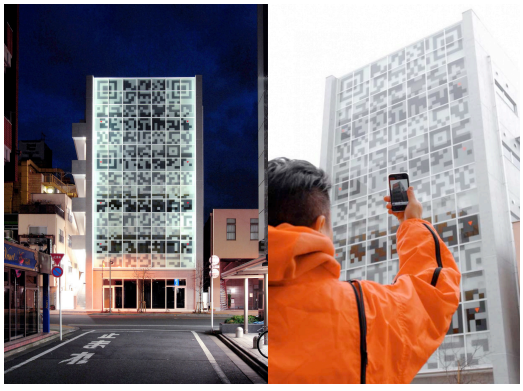


Figure 8. The Teradadesign Architects building in Tokyo. The street-facing outer wall of this shopping centre is covered with QR codes which provide the user with information about the shops inside, as well as highlighting special offers.

Opportunities for ceramics:

- Going beyond simply integrating screens in urban fittings and surfaces.
- Exploring the potential of building technology into building façades.
- Detecting urban spaces with a steady stream of pedestrians with information needs.

3.1.5. SUSTAINABLE LIGHTING

Energy consumption in cities is one of the key issues for urban planning, so systems that use alternative energy sources and adapt to the required service at all times are instrumental to being more efficient.

One option is to provide urban fittings and objects with luminescent properties as alternative sources of light. The Glowing Plant project uses synthetic biology to provide bio-luminous particles in plants that perform a lighting service both indoors and outdoors. Photo-luminescent paving systems act by capturing light during the day and projecting it at night, so they can be used to create secondary or decorative lighting on a footpath or as emergency signage.

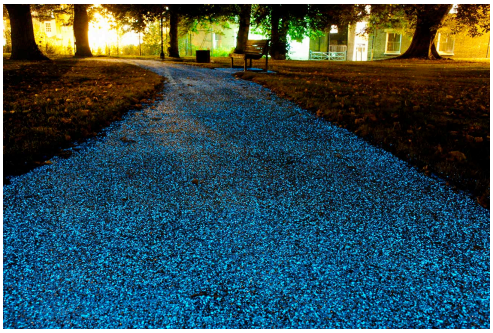


Figure 9. *Pathway by Pro-Teq is a sprayed flooring system comprising an elastomer membrane to which different functions can be added, such as this photoluminescence.*

Opportunities for Ceramics:

- Designing low energy-consuming lighting systems.
- Coming up with lighting systems that adapt to required use in order to achieve greater energy efficiency.
- Building energy-efficient lighting systems into other objects

3.1.6. NEW URBAN ICONS

Cities strive to forge a **genuine and unique personality** for themselves, capable of differentiating them from other cities in various aspects: tourism, transport, culture, business... Architecture enhances the creation of **urban icons** that, far from creating spectacular but easily replicable structures, build visual symbols that capture and transmit a particular city's **unique culture and identity**. **Traditional materials and industries** play an important role in urban identity.

Figure 10. *Bollard in the French city of Limoges, known worldwide for its ceramics industry. Designed by Marc Aurel for Porcelaines Arquié*

Opportunities for ceramics:

- Creating urban products capable of adapting to the unique character and requirements of each city.
- Solutions for individual cities that are unique capable of stating its cultural message.
- Means of teaching and promoting the cultural heritage and identity of the city.
- Proposals that highlight what the city already has as well as creating urban icons.

3.2. TRADITIONAL SECTORS IN SMART CITIES

The prospects of smart cities and advances in the IoT (Internet of Things) are driving the development of a growing market with great potential. But what role can traditional industries play in this new scenario? It is a complex issue for the sector, as the use of ceramics in the urban environment is relatively recent, so our industry faces two challenges of great significance: to understand the nature of the game and become acquainted with the players on the public market, and secondly, to find its own place vis-à-vis technology sectors.

The penetration of ceramics in urban settings and in particular in the field of Smart Cities, entails, firstly, understanding what the current and future requirements are in regard to urban management of both public bodies and also of citizens. That means observing life in the city and understanding what the trends with the greatest potential are, identifying opportunities and proposing solutions that match them. Ceramic industries will also need to open their strategy to collaboration with other organisations and enterprises that can provide support for the development of such ideas. In the survey of professionals from the sector, 60% of respondents appreciated the need for alliances with other companies, with scores of over 7 out of 10, while nearly 30% thought such alliances were highly relevant and appraised them with the highest possible score.

There are certainly many barriers and difficulties on the road to the Smart Cities market, as ceramic companies already know. Prominent among the difficulties they face, according to the survey, are the lack of knowledge about the profitability or potential income from this new market, the imperative to invest in R&D in order to compete effectively, the need for new commercial networks and for taking a new perspective on the company's current design process, and managing to direct business insight toward understanding the needs of consumers in this new market, to name just a few.

Understanding one's own weaknesses and threats, looking around to identify needs, and being able to provide ingenious and innovative solutions are some of the keys ways of entering this new market that are born from research.

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