

YOUR SKILLS, OUR FUTURE

# KEY SKILLS FOR INFRASTRUCTURE & CITIES TRANSFORMATION



We're experiencing a global Industry Renaissance today, bringing new ways – real and virtual – of seeing the world, inventing, learning, producing and trading. Tomorrow's game-changers will not be those with the most automated production systems, but those who build a culture of knowledge and know-how to reveal and train the Workforce of the Future, able to solve the challenges of a planet lacking sustainable solutions.

**BERNARD CHARLÈS**  
Chairman of the Board  
and Chief Executive Officer

# FOREWORD





By 2050, 68% of the world's population will be living in cities. Making cities inclusive, safe, resilient and sustainable is one of our biggest challenges ahead. The Infrastructure & Cities sector has to accelerate its transformation drastically engaging altogether public authorities, industry leaders and citizen.

**“The only progress is human”**

At Dassault Systèmes, we are convinced that progress stems from people over technology. When innovations are made by people, for people, they can induce positive change, and trigger real progress. And this is how we'll tackle current, and future stakes.

To drive progress, people need to be empowered with the right skills, knowledge and know-how: the ones they need to invent new usages, create disruptive experiences, build more efficiently and sustainably. Learning and skills development are at the heart of the change.

As the strategic transformation partner for global Industrial and Academic leaders, Dassault Systèmes plays a unique role in this transformation. This is why we are very pleased to share this new publication from **3DEXPERIENCE® Edu**, whose missions include fostering collective intelligence on key emerging roles and skills.

This e-book is part of a series of publications called “Skills wanted for sustainable innovations,” which share the view of **3DEXPERIENCE** Edu and its ecosystem of partners and customers, on the evolution of the key jobs, disciplines and skills for delivering sustainable innovations.

This publication focuses on revealing the pivotal skills to empower Infrastructure & Cities sector’s players and accelerate its transformation. Thanks to a social listening study, in partnership with Bloom, the publication also highlights how those skills are discussed on social media today.

### Sector’s challenges

39%

CO2 emitted

40%

waste generated

33%

energy consumed



# INFRASTRUCTURE & CITIES: PIVOTAL SKILLS FOR NEW CHALLENGES

Citizen participation, climate-proof design, decarbonization of the whole value chain, circular economy encapsulation, energy-positive building and operations: the Infrastructure & Cities sector has a clear agenda to accelerate its transformation. It is a huge opportunity for innovation, but also are the stakes.

This new paradigm requires massive reskilling and upskilling for all Infrastructure & Cities sector's players, to empower them all along the value creation and decision-making processes.

Frédéric Gal, Program Director at Bouygues Construction, says: "There is a critical skills shortage on the Construction Industry. We face problems finding a skilled workforce for our projects. Construction industry is one of the less digitalized; we do not seek to digitalize our current processes but rather to

address what could be the transformation of the sector".

### **Key skills and disciplines for building tomorrow**

From conversations with our customers and the industry ecosystem, we have identified key skills that are necessary to accelerating transformation and delivering more sustainable experiences for infrastructure and cities: **Civil Engineering, Data Science, Generative or Computational Design, Systems Engineering, Carbon footprint management, and Mobility Planning.** Underpinning all those disciplines and skills and fostering multi-disciplinarity, the **3DEXPERIENCE** platform provides a single environment for the next generation of innovators to collaborate in the virtual world, and create the conditions to improve the real world.

“Digital technologies are facilitating the rapid development of intelligent buildings, smart cities, and sustainable infrastructure. It is imperative that our students master these technologies to become the senior managers needed to build the world of the future,” said Joël Cuny, Chief Executive, ESTP Engineering School Paris.

In the graph on the next page are the disciplines, powered by the **3DEXPERIENCE** platform, and their identification as “foundational” or “pivotal”. Those disciplines are composed of skill sets that are not all mentioned in this document. They are and will be detailed in dedicated publications: Civil Engineer, Systems Engineer, Mechatronics Engineer, Industrial Engineer, or Additive Manufacturing Designer at [Skills website](#).

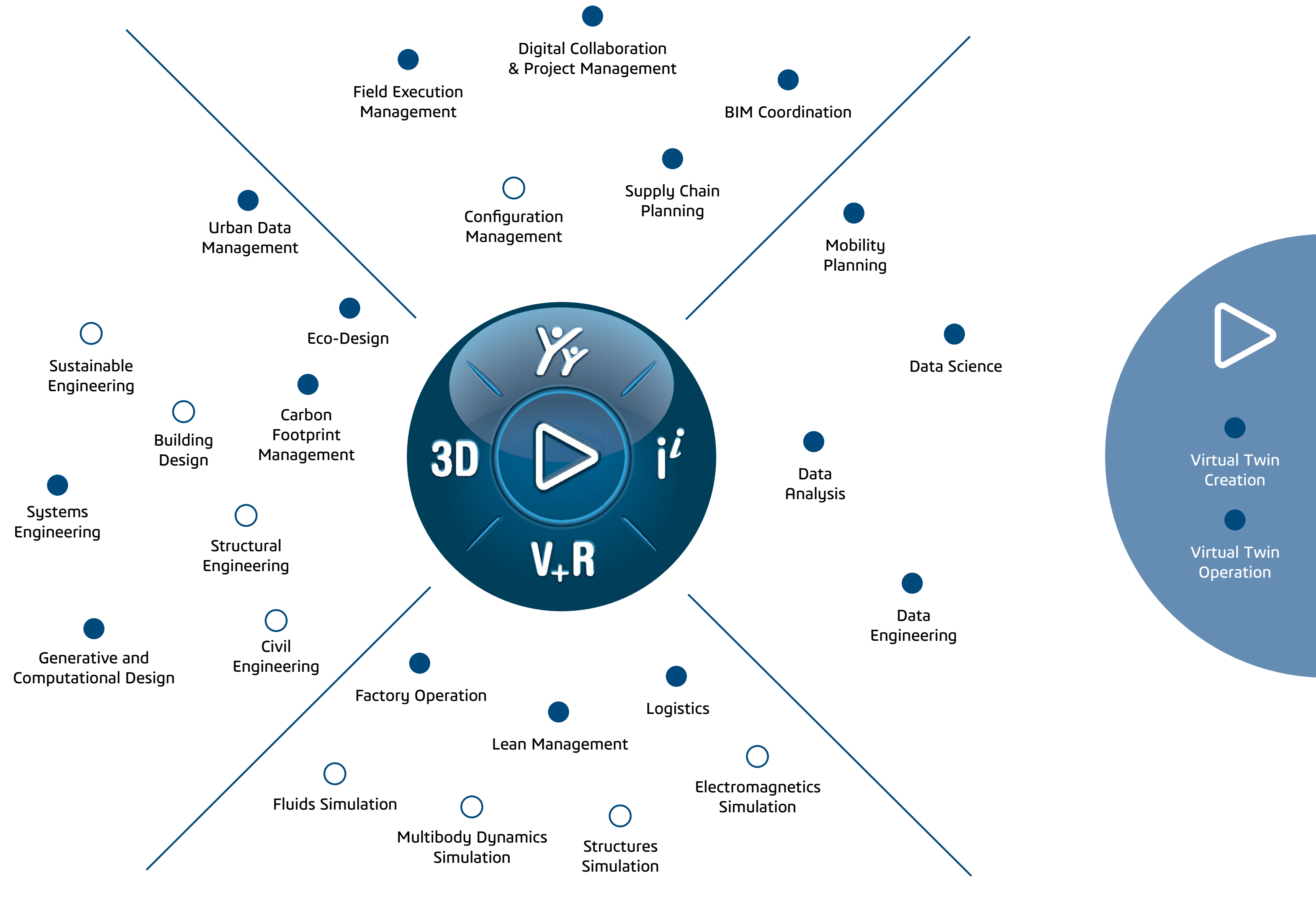
“**Virtual twin experiences**”, enabled by the **3DEXPERIENCE** platform, offer one single and shared virtual model of the city, where all stakeholders can rapidly and collaboratively explore every potential scenario by modelling, simulating, and visualizing change in real-time, with entire cities, predicting future behaviors to create efficient solutions at every stage from design, construction and operation, to demolition or recycling of materials.

**“ The architecture, engineering, and construction (AEC) disciplines are experiencing a paradigm shift in how we should think about data, integration, sustainability and technologies to better deliver more efficient and sustainable cities and infrastructure. Through our use of the 3DEXPERIENCE platform we are educating our students to be the change makers and future innovators. ”**

– David Gerber, Professor and Program Director  
Viterbi School of Engineering



# PIVOTAL SKILLS TO ACCELERATE INFRASTRUCTURE & CITIES TRANSFORMATION





**SOCIAL LISTENING  
TO REVEAL CONVERSATIONS  
ABOUT INFRASTRUCTURE  
& CITIES SKILLS**

Anticipating changes also means getting more and more engaged to further develop these new skills. This starts with raising awareness and fostering conversations around them.

To do so, we worked with our partner Bloom, an artificial intelligence (AI) platform dedicated to qualitative, predictive and strategic analysis of social networks, to perform an analysis of the different mentions of these identified skills in the Construction sector, more precisely for Infrastructure & Cities.

We ran a social listening study on five social media networks (Facebook, Twitter, Instagram, YouTube & TikTok) and their associated websites and blogs, in two languages (English and French) over a one-year period (July 2021 to 2022) to discover how those disciplines and skills are

### **About bloom methodology**

Social networks contain an enormous amount of information that can be mined for powerful insights. Bloom's unique approach uses semantic and social inference techniques to achieve unparalleled depth and accuracy in the analysis of digital communities. It exploits the unique characteristics of networks to study the propagation of information, to identify the opinions of actors and to measure their influence ("social inference"). Learn more at <https://bloomsocialanalytics.com/en/>

discussed and by whom. The content includes a mix of text, pictures and video content, to see which topics are raised, those arising, and those which gather the strongest levels of engagement. Then we could improve their noise, and eventually broaden their reach across our ecosystem.

The data set gathered 20 skills and disciplines that we identified through our research. Over this 12-month period, we collected more than 100,000 documents (posts + comments) that garnered more than 8.5 million engagements (likes, shares and comments) from almost 3 million unique actors.

The English language represented 94% of all documents, and almost 100% of the activity (documents and engagements), even on French platforms.

more than  
**100,000**  
documents (posts and comments)  
collected

**20**  
skills and disciplines  
identified

**8.5**  
million engagements  
garnered from almost  
**3**  
million unique actors



# LESSONS LEARNED FROM SOCIAL LISTENING



**So, what did we learn?** Let's see first who is talking about Infrastructure & Cities skills, and on which platform.

- **Twitter** by far hosted the most conversations on the skills topics, accounting for 75% of the posts and comments. However, it shows a very low activity (documents plus engagements), accounting for only 2%. This network gathers many publications from all kinds of actors: journalists sharing their views, companies highlighting their know-how, academics, experts or architects sharing learning and opinions on future cities, with a shared focus on mobility and innovative means of transportation.
- **Instagram** generated the largest activity among the platforms with 69% of the total activity. Mostly architecture and design enthusiasts are sharing inspiring and visual

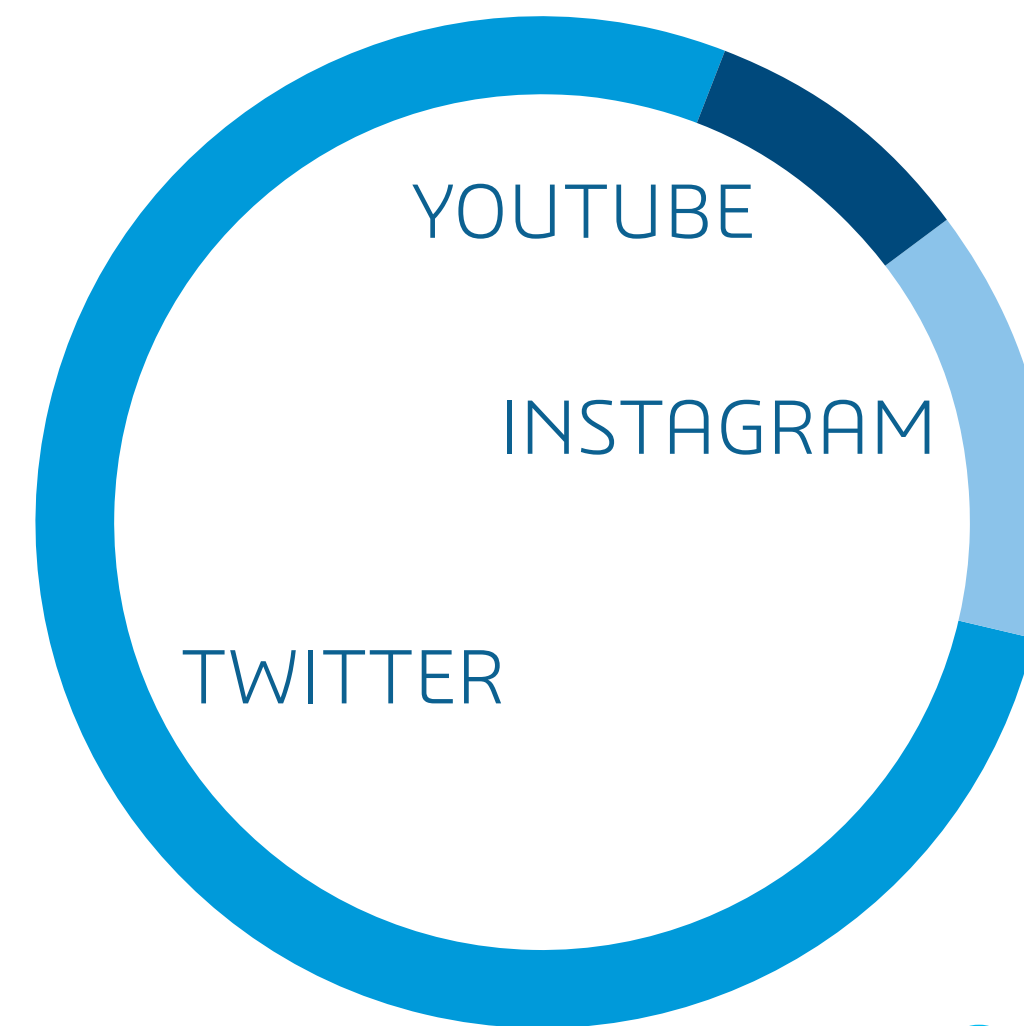
computer-designed monuments with structures in wood, steel, aluminum, glass, limestone, etc.

- **TikTok** is second, generating about 16% of the activity, primarily featuring tutorials or videos published by civil engineering influencers showcasing specific disciplines and why they are critical in today's cities, as well as engineers who share their personal expertise and daily work.
- **YouTube** accounted for 12% of all activity, a high percentage of which being academics, engineering experts or companies providing information in the field of civil engineering through teaching, tutorials, advices or education courses.
- **Facebook** accounted for less than 1% of both activities and documents. It does not seem to be the right place to engage people on such topics.

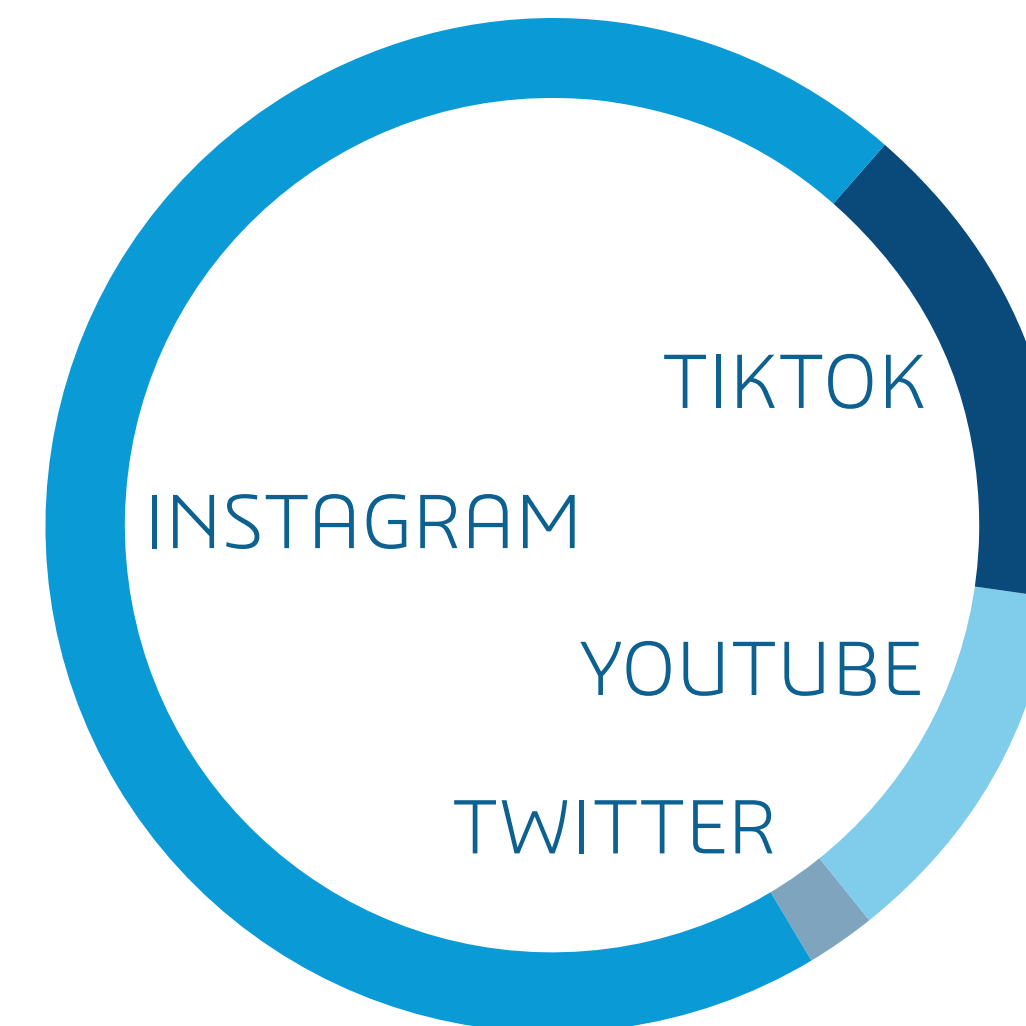
More generally, the study confirms that **individuals, whether they are engineering experts or architecture enthusiasts, are now the primary path for passing on information** within the targeted communities. With the same amount of content posted, they generate more engagement than academics or companies.

Video formats especially work best when it comes to illustrating complex and technical skills. An engineer is making the buzz on TikTok for example (@everydayengineering), garnering almost 163,000 followers with tutorial videos like one describing the “day in the life of a civil engineer”.

### DOCUMENTS BY PLATFORM



### ACTIVITY BY PLATFORM



## KEY TAKEAWAYS: THE STATE OF CONVERSATIONS ABOUT SKILLS

We can observe from the social media analysis that foundational and technical skills of the Infrastructure & Cities sector are being discussed and can trigger strong engagement, when addressed in an engaging way. But there is still a **massive opportunity for emerging pivotal disciplines to be profiled as well, helping to explain how critical they are and which jobs require them, now and in the future.**

Let's make a deep dive into these key skills, either foundational or pivotal:

### Civil engineering

As a foundational and very established skill, **Civil Engineering is the most discussed today, and also shows a strong potential**

**in the future.** It triggers high interest and numerous reactions, both in English and French languages. For now, it is particularly visible in India (47% of documents in English) on TikTok (42%) and YouTube (32%). The conversations are mostly coming from engineers and academics sharing about their daily work and expertise, providing explanatory videos or training courses.

### Generative and computational design

With almost 5 million engagements for only 11,000 documents, this **skill generates a lot of reactions on social media, and triggers highly positive emotions** due to the esthetics of such discipline. It is mostly addressed through the hashtag #computationaldesign on Instagram, by design enthusiasts who



share inspiring computer-designed work of art. It is mainly showing how computational and generative design can help cities become more attractive and unique.

### **Sustainable engineering**

Overall, **sustainable engineering shows good presence** in conversations, mostly on Instagram (68%), with **high emotional intensity**, and this field is expected to become increasingly important in the future. It is however rarely discussed as a skill but more a topic in general, namely by architecture professionals and enthusiasts publishing best-in-class examples of sustainable buildings and ideas to meet net zero in the construction industry, or design experts speaking about the importance of green construction for future cities.

When it comes to related skills, **carbon footprint management** is also rarely discussed as a skill but rather when discussing climate change challenges. It shows high potential as a topic addressed in conversation for the future as well. It is discussed mainly by institutions and NGOs, and most conversations are on Twitter (90%, and even 95% in the French language), and related to greener mobility in cities. In the French language, Carbon footprint Management is even more powerful and the most common entry point for environment-related topics, much more than Eco-Design, which shows less potential in the future.

### **Urban data management**

Data in the Infrastructure & Cities sector gathers a quite reasonable number of documents (14,4k documents for the English language) but engagement remains

low, with only 15,5k reactions. However, **the related skills seem to gain interest** mostly on Twitter. The platform gathers **many job offers and demands**, namely for Data Science PhD positions in the fields of urban geography, urban resilience or urban logistics.

Remaining conversations gather professionals (engineers or data specialists) who share their latest tips and news about their job, or researchers, for whom Urban Data Science is often associated with Spatial Data Science, highlighted as a way to create more inclusive cities and fight against inequalities. They spread the news on Twitter by sharing their opinion and knowledge during workshops and, sometimes, sharing their results on detailed papers with open access.

### **Digital collaboration**

With a low volume of conversations, digital collaboration needs to regain attention, as it is pivotal to accelerate the sector's transformation. Digital collaboration across different disciplines and between the different Infrastructure & cities' actors is key to enable science-based decisions and policies. Good news is, the potential on this topic is very high, namely because of the emotions it can trigger, which are unanimously positive. It's now time to convince and hand over the conversation to individuals, **who can generate more engagement around this pivotal skill**, for example by demonstrating how citizen engagement can contribute to better decision-making by public authorities.

# CONCLUSION



**Knowledge and know-how are what will help people to make a difference in the way we address current sustainability challenges. And social conversations, as both a mirror of and an engine for these new skills, are crucial to ensuring their identification, attention and their development for the current workforce and future graduates.**

In this sense, and as the skills gap continues to widen, finding new ways to communicate about these skills to help them gain momentum, and measuring engagement around them, is critical. The result of this study is irrevocable: effort has to be made to foster conversations about these pivotal skills.

Social listening offers powerful means to understand the state of the conversations around this essential topic for Infrastructure & Cities sector's transformation.

We will keep measuring engagement around those skills, and continue to work hard in this direction with all our partners, either from business or academia. We will also continue to facilitate these conversations and drive innovative ideas and approaches to generate more engagement.

But we'll need your help to accelerate: it's time to join the conversation! We look forward to seeing your own social media campaigns on skills. See you soon there!

[Visit our Skills website](#) for more information.

#pivotalskills #foundationalskills #logistics  
#virtualtwinexperience #urbandatamanagement  
#ecodesign #buildingdesign #sustainableengineering  
#dataengineering #carbonfootprintmanagement  
#systemsengineering #structuralengineering  
#generativedesign #supplychainplanning  
#civilengineering #simulation #leanmanagement  
#dataanalysis #datascience #mobilityplanning  
#configurationmanagement #digitalcollaboration  
#projectmanagement

## For more information, visit our **3DEXPERIENCE Edu Skills website**

Our **3DEXPERIENCE®** platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3DEXPERIENCE** platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 300,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit [www.3ds.com](http://www.3ds.com).

