

# Digi-CVET

Developing transversal digital competences for digital  
Continuous Vocational Education and Training in construction

2021-1-DE02-KA220-VET-000025109



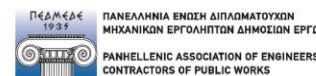
## Digital Communications



**BZB**  
Bildungszentren des  
Baugewerbes e.V.



Gospodarska  
zbornica  
Slovenije  
Chamber of Commerce  
and Industry of Slovenia  
Chamber of Construction  
and Building Materials Industry  
of Slovenia



● ● Kröpin Projekt  
GmbH



Co-funded by  
the European Union



## What will you learn in this module?

- The lesson deals with the digital communication in the construction sector
- Introduction on digital communication
  - Understanding digital communication tools: tools and modes
  - Netiquette among branch staff
- Branch specific platforms
  - Platforms as a paradigm shift
  - Digital Communication through BIM
  - Digital Communication through AR/VR
- Data security requirements among construction stakeholders
  - GDPR in the construction sector
  - Data security in the construction sector
  - Cybersecurity challenges in the construction industry
- Proper use of social media
  - Social Media Strategy and Marketing: general implications
  - Potential benefits of social media for construction organisations

## A. Introducing digital communication

### Content

#### A1. Understanding digital communication tools: tools and modes

#### A2. Netiquette among branch staff



Source:<https://us.123rf.com/450wm/apinan/apinan1411/apinan141100030/33657365-people-social-business-on-cloud.jpg?ver=6>

## A. Introducing digital communication

### A1. Understanding digital communication tools: tools and modes

Digital communication is any type of communication that relies on the use of technology and commonly referred as digital communication channels. These include email, phone calls, video conferencing, and many types of instant messaging like SMS and web chats. Even blogs, podcasts, and videos are considered forms of digital communication. This section will focus specifically on modes and tools in order to provide the context for the upcoming information.



#### Modes:

Modes of communication refer to two aspects: spatiality and synchronicity.

#### Tools:

Tools refer to the means of communication, for example: instant messaging (IM), email, social media, and bulletin boards.

Source:

<https://www.6amgroup.com/internal-communication-tools-to-keep-your-event-team-organized/>



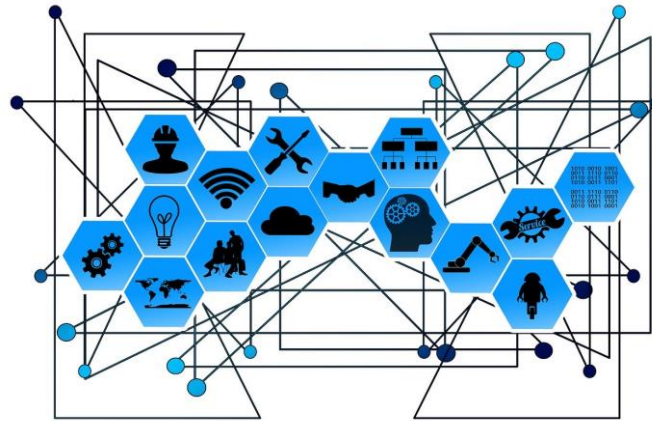
## B. Branch specific platforms

### Content

#### B1. Platforms as a paradigm shift

#### B2. Digital communication through BIM

#### B3. Digital communication through AR/VR



Source: <https://www.6amgroup.com/internal-communication-tools-to-keep-your-event-team-organized/>

## B. Branch specific platforms

### B1. Platforms as a paradigm shift

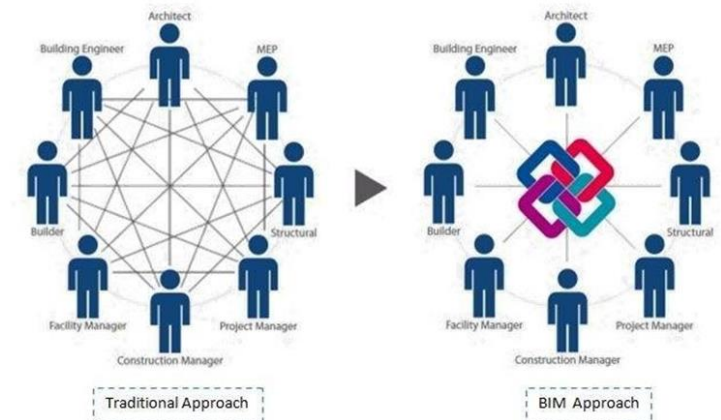
Construction projects are complex and organisationally characterised by a high degree of fragmentation. Need for clear communication and collaboration between the project participants in order to ensure project's success.

Advances in communication technologies have enabled construction project members to supplement face to face (FTF) communication with methods based on computer mediated communication (CMC).

The emergence of modern design software + other communication tools enables designers to undertake collaborative design while being geographically remote from one another.

Tools that are used in construction sector:

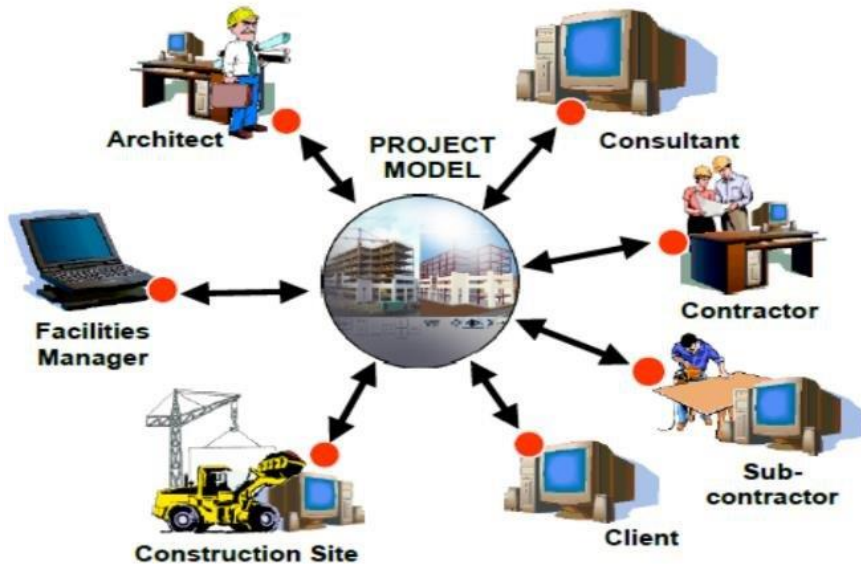
- Building Information Modelling (BIM)
- Virtual Reality (VR) / Augmented Reality (AR)



## B. Branch specific platforms

### B2. Digital communication through BIM

BIM has the potential to improve communication in the construction industry and this section is dedicated to its theoretical and practical implications.



2.1 Theoretical background: BIM

2.2 BIM Communication Protocols (Open & Closed BIM)

2.3 Communication of BIM data (data types, input & output data)

2.4 BIM and Project Communication Networks (communication between stakeholders, data exchange between phases)



## B. Branch specific platforms

### B2.1 Theoretical background: BIM

Communication issues in construction industry are an important matter due to their direct influence on quality of works. Digital support such as BIM software could provide assistance in increasing transfer of information between parties that work in the design and use phase (Dubas & Paślawski 2017). With BIM, project team actors can work together in a shared environment, existing of a 3D model and other tools.



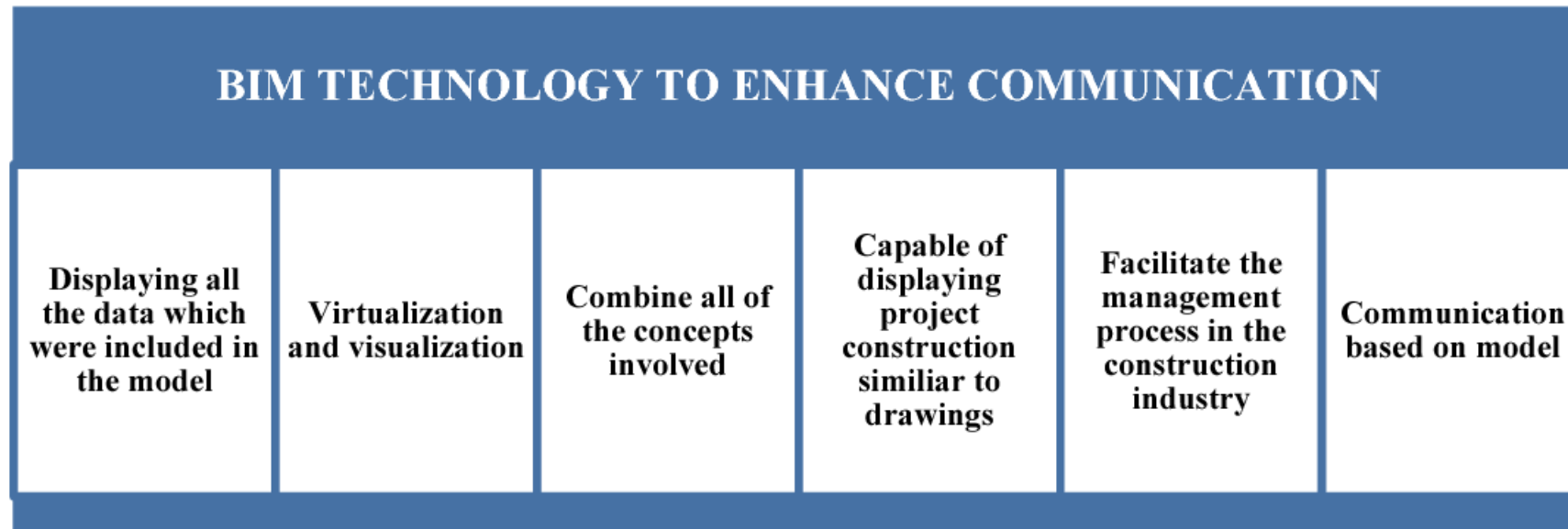
BIM on practice - BIM and communication



Does BIM improve project communication?

## B. Branch specific platforms

### 2.1 Theoretical background: BIM



**Figure 4 BIM Technology to Enhance Communication**

Source: <https://d3i71xaburhd42.cloudfront.net/3f8e014b77430efbdd7bc0a949c333a5b16e839d/7-Figure4-1.png>

## B. Branch specific platforms

### 2.2 BIM Communication Protocols (Open BIM)

#### Open BIM communication protocol

Open BIM is a collaborative process that is inclusive of all participants, promoting interoperability to benefit projects and assets throughout their life cycle.

- Model data and information are easily traded between software systems.
- Provides a common language for the exchange of information within a multidisciplinary project team.
- It is based on standard formats – such as IFC– information can be easily used in different applications to streamline workflows and minimize errors

What is openBIM?



Source: [https://www.researchgate.net/figure/Information-Communication-Model-of-BIM-Tekla-2016\\_fig1\\_324780674](https://www.researchgate.net/figure/Information-Communication-Model-of-BIM-Tekla-2016_fig1_324780674)

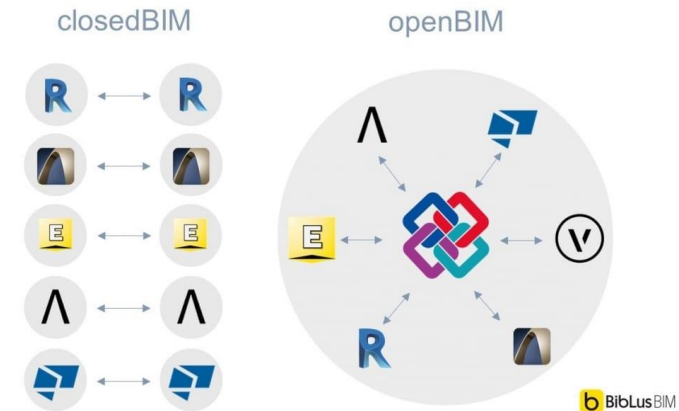
## B. Branch specific platforms

### 2.2 BIM Communication Protocols (Closed BIM)

#### Closed BIM communication protocol

Closed BIM is a BIM environment where the same software of a BIM application is used by all key project stakeholders.

- Collaboration within a defined software environment based on native data formats and distinct processes
- Requires the user to license a specific software solution and train users
- Data is stored in a native format that can only be accessed by the application from which it was created



Source: <https://cdn-resources.accasoftware.com/accasoftware/images/open-bim-vs-closed-bim/what-is-difference-between-bim-openbim.jpg>

## B. Branch specific platforms

### 2.3 Communication of BIM data (data types, input & output data)

Within the BIM model, two different types of data are needed: input data and output data.

#### INPUT DATA

- Input data is required in the design stage
- It relates to products and components which are to be used in the building
- This data needs to contain parameters, visuals, and specifications

#### OUTPUT DATA

- Output data is required after the design stage
  - Can be done in software-specific files
- BUT
- Output data files open like IFC\*



Interoperability in BIM and data exchange



BIM Data: Why argue file types?

\* IFC stands for Industry Foundation Classes and is the open and neutral data format for the exchange of BIM data. The standard can be used by several partners in the building chain with different software.



## B. Branch specific platforms

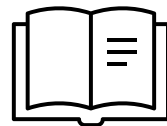
### 2.4 BIM and Project Communication Networks (communication between stakeholders, data exchange between phases)

For a good communication with BIM, clear objectives should be communicated between stakeholders\*

A well-considered and suitable design



Reduce costs and improve efficiency in the operation phase, e.g. by the placement of departments and wayfinding



READ MORE about BIM use to exchange information and its challenges [here](#).

\*The project stakeholders can be architects, engineers, (sub)contractors, but also new roles that emerge due to BIM, such as BIM managers and BIM designers. Existing roles of project actors, such as architects, can also change because e.g. different technical BIM related skills are required. BIM can be used for information management between these different roles of the design team and the client and its endusers.

## B. Branch specific platforms

### B3. Digital communication through VR/AR

This section is dedicated to the digital communication enabled by Virtual and Augmented Reality interpretation in the construction sector. A general overview as well as specific branch-oriented information will be provided.

#### 3.1: Theoretical background: Augmented Reality

- Definition of Augmented Reality (AR)
- AR implications in construction

#### 3.2: Theoretical background: Virtual Reality

- Definition of Virtual Reality (VR)
- VR implications in construction

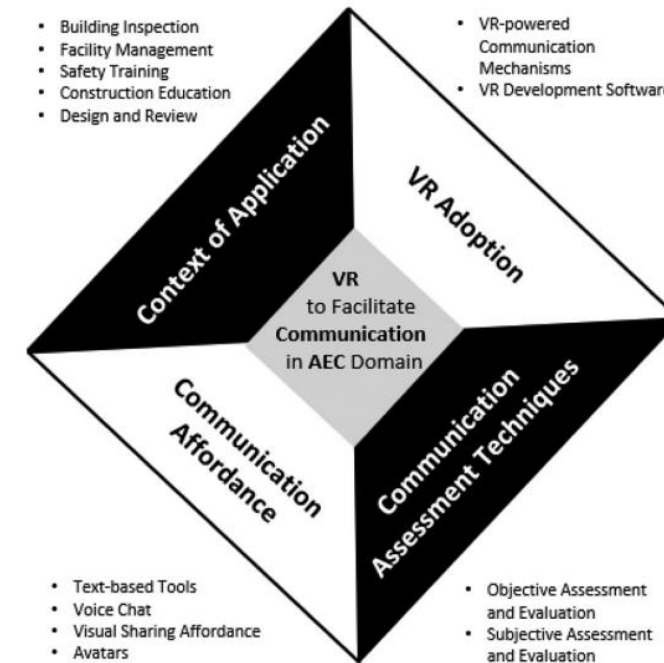


Figure 5.  
Review taxonomy

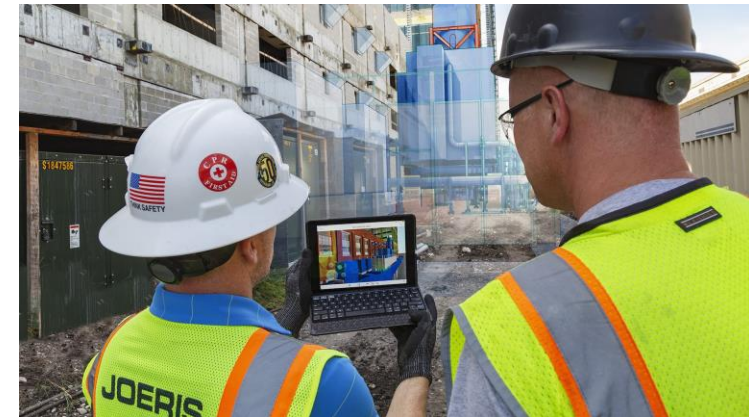
## B. Branch specific platforms

### B3. Definition of Augmented Reality (AR)


 What is Augmented Reality (AR) in 60 seconds

#### AR in construction

- It can be used to display details and elements on the construction plan
- All parties involved succeed in creating a deep understanding of the project, by visualizing working models



Source: <https://constructionblog.autodesk.com/augmented-reality-ar-construction/>

 High-accuracy Augmented Reality for civil construction projects





## B. Branch specific platforms

### B3. AR implications in construction

- Visualizing project information in real time

Key advantage: the combination of documentation and digital information.



It enables employees, architects, engineers and customers alike to regularly monitor the process on the construction site. Another option is to perform construction measurements and gauge project efficiency.

- Encouraging team members communication


AR ensures that all team members communicate and are utilized in the best possible way.

- Progress capture

AR technology can be used in project presentations, for progress capture, for enhanced communication, for better safety, and when construction training is needed.


## B. Branch specific platforms

### B3. Definition of Virtual Reality (VR)

 What is Virtual Reality (VR) in 60 seconds

#### VR in construction

- The use of Virtual Reality in the construction industry gives managers as well as other employees a clear, more realistic view of what to expect on the job site.

 Virtual Reality in construction industry



1. What are the major challenges of the construction industry
2. What are the benefits of VR in the construction industry
3. How VR works for new buildings construction
4. Top 5 VR softwares



Source: <https://www.pbctoday.co.uk/news/planning-construction-news/vr-in-construction/57709/>



## B. Branch specific platforms

### B3. VR implications in construction-communication aspect

#### ➤ Supports visual communication

VR environment also supports visual communication by providing shared virtual workspace for exchanging drawings, models, and other files synchronously. An Avatar is a digital human in a virtual world operated by a live participant (Eiris and Gheisari, 2017).

#### ➤ Avatar's potential

This type of non-verbal behaviours, which usually include eye contact, distance, body orientation, movement, facial expression, gestures and selected features of the spatial environment, can encourage social exchanges and improve interaction efficiency in virtual settings



Utilizing VR for construction as a coordination & communication tool

## C. Data security requirements among construction stakeholders

### Content

#### C1. GDPR in the construction sector

#### C2. Cybersecurity challenges in the construction industry



Source: <https://www.unisys.com/siteassets/images/collateral/news/un-cybersecurity-tips-for-online-learning-overview.jpg>

## C. Data security requirements among construction stakeholders

### C1. GDPR in the construction sector

The construction industry is using vast amounts of personal data which is normally part of a building project's development. This section will provide knowledge on the rationale of GDPR as well as on current implications in the construction sector.

- 1.1: Theoretical background: GDPR
- 1.2: Basic principles, objectives, and policy framework
- 1.3: GDPR implications in the construction sector



Source: <https://www.letsbuild.com/blog/gdpr-in-construction>

## C. Data security requirements among construction stakeholders

### 1.1: Theoretical Background: GDPR



What is the GDPR?

- The GDPR may be an EU mandate, but it impacts every country
- GDPR requirements applies to virtually all kinds of personal data
- GDPR compliance requires you to respect users have 8 basic rights regarding personal data and data privacy
- The regulation was put into effect on May 25, 2018.



# C. Data security requirements among construction stakeholders

## 1.2: Basic Principles & Objectives

### THE SIX GDPR PRINCIPLES TO ENSURE ACCOUNTABILITY

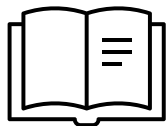


## C. Data security requirements among construction stakeholders

### 1.3: GDPR implications in the construction sector

Specific examples of an exchange of personal data in a construction project may include:

- a local authority passing on personal details of a property occupant on to a property maintenance contractor that it engages
- an employer providing a contractor with details of its suppliers in order for the contractor to procure materials; and
- a housebuilder employer asking a contractor to rectify defects to a property that is already occupied; and/or the request from the home office, or immigration enforcement officers regarding working/VISA status of the individuals working on the construction site.



[GDPR – is it relevant to the construction industry?](#)

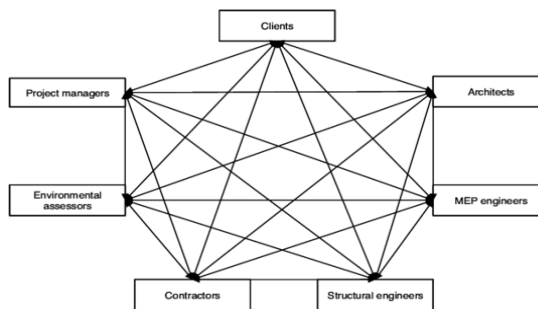


## C. Data security requirements among construction stakeholders

### 2. Cybersecurity Challenges in the Construction Industry

This section will provide detailed information about the concept of cybersecurity and specific types of digital threats and mitigation strategies.

- 2.1: Theoretical Background: the concept of cybersecurity
- 2.2: Paradigms of digital threats: analysis
- 2.3: Elaboration on industry-specific risks
  - The role of cybersecurity in construction
  - Cybersecurity risks in construction





## C. Data security requirements among construction stakeholders

### 2.1: Theoretical Background: The concept of Cybersecurity

Cybersecurity is the application of technologies, processes, and controls to protect systems, networks, programs, devices and data from cyber attacks. It aims to reduce the risk of cyber attacks and protect against the unauthorised exploitation of systems, networks, and technologies.



What is the cybersecurity?



8 Most Common Cybersecurity Threats



## C. Data security requirements among construction stakeholders

### 2.2: Paradigms of digital threats: Analysis

#### Malware

Malware means malicious software. One of the most common cyber threats, malware is software that a cybercriminal or hacker has created to disrupt or damage a legitimate user's computer. Often spread via an unsolicited email attachment or legitimate-looking download, malware may be used by cybercriminals to make money or in politically motivated cyber-attacks.

There are a number of different types of malware, including:

- Virus
- Spyware
- Botnets



Malware - Security Awareness Video

## C. Data security requirements among construction stakeholders

### 2.2: Paradigms of digital threats: Analysis

#### Phishing

Phishing is when cybercriminals target victims with emails that appear to be from a legitimate company asking for sensitive information. Phishing attacks are often used to dupe people into handing over credit card data and other personal information.

#### Man-in-the-middle attack

A man-in-the-middle attack is a type of cyber threat where a cybercriminal intercepts communication between two individuals in order to steal data. For example, on an unsecure WiFi network, an attacker could intercept data being passed from the victim's device and the network.



How To Recognize and Avoid Phishing Scams in 2022




What Is A Man-in-the-Middle Attack?

## C. Data security requirements among construction stakeholders

### 2.3: Elaboration on industry-specific risks

Cyber security is a growing challenge, and the pandemic has amplified the need for the construction sector to have a robust cyber risk strategy. Many firms have started using Internet of Things (IoT) technologies. As helpful as these devices are, they also expand these companies' attack surfaces. Similarly, construction teams have moved from paper workflows to the cloud, introducing new vulnerabilities.

A simple line-art icon of a clipboard with a pencil, indicating a survey or report.

A recent Forrester survey (January 2020) revealed that more than 75% of respondents in the construction, engineering and infrastructure industries had experienced a cyber-incident within the previous 12 months.



Cyber Security for the Construction Industry

## D. Proper use of social media

### Content

#### D1. Social Media Strategy and Marketing: General Implications

#### D2. Potential benefits of social media for construction organisations



Source: <https://www.entrepreneurshipinbox.com/wp-content/uploads/Social-Media-Strategy-in-5-Steps.png.webp>

## D. Proper use of social media

### 1. Social Media Strategy and Marketing: General Implications

Social Media can be considered as a strategic tool for corporate communication that can enhance stakeholder participation and engagement. This section will be dedicated on the concept social media strategy and its benefits as well as will provide guidance on its development.

Business objective	Social media goal	Metric(s)
Grow the brand	<b>Awareness</b> <i>(these metrics illuminate your current and potential audience)</i>	Followers, shares, etc.
Turn customers into advocates	<b>Engagement</b> <i>(these metrics show how audiences are interacting with your content)</i>	Comments, likes, @mentions, etc.
Drive leads and sales	<b>Conversions</b> <i>(these metrics demonstrate the effectiveness of your social engagement)</i>	Website clicks, email signups, etc.
Improve customer retention	<b>Consumer</b> <i>(these metrics reflect how active customers think and feel about your brand)</i>	Testimonials, social media sentiment, average response time (for social customer service/support) etc.

1.1. Social Media Strategy and Marketing: General Implications  
1.2 Potential benefits of social media for construction organisations

## D. Proper use of social media

### 1. Social Media Strategy and Marketing: General Implications

A social media strategy is an outline of the content that your business will post, the responsibilities of your social media team, and the social media channels you will use to promote your business



How to Create a Marketing Plan



Digital Marketing Strategies

Source: <https://digitalschoolofmarketing.co.za/social-media-marketing-blog/how-to-formulate-your-social-media-marketing-strategy/>



**SOCIAL MEDIA STRATEGY**

- WHO IS YOUR CUSTOMER?**
  - What age bracket?
  - Gender?
  - Location?
  - College degree?
- WHERE IS YOUR AUDIENCE?**
  - Are they online?
  - Where do they shop?
  - Belong to associations?
  - Publications they read?
- WHAT ARE YOUR GOALS?**
  - Establish your brand?
  - Increase visibility?
  - Generate traffic to website?
  - Grow sales & revenue?
- WHEN WILL YOU COMMUNICATE?**
  - What social networks?
  - How often will you post?
  - Will you blog?
  - Will you use visuals/video?
- WHAT DIFFERENTIATES YOU?**
  - What's your elevator pitch?
  - Gather best testimonials
  - What make you unique?
  - Craft a compelling story
- HOW WILL YOU EXECUTE?**
  - What do you need to learn?
  - What tools are necessary?
  - Who is responsible?
  - How will you measure?

**ACCREDITED DIGITAL EDUCATION** | **DSM** | **DIGITAL SCHOOL OF MARKETING**



## D. Proper use of social media

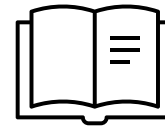
### 2. Potential benefits of social media for construction organisations

The construction companies are using social media for the following applications:

- recruitment
- disseminating company's and/or projects' news
- client networking
- brand awareness
- showcasing innovations

#### Benefits:

- Knowledge management
- Business development
- Marketing/advertising
- Brand and industry awareness



[Use of social media in construction industry: A case study](#)



How to grow a construction company on Social Media



Social Media Marketing for Construction Companies: build a dialogue with your market



## References

- Abbas, A., Choi, M., Seo, J., Cha, S. H., & Li, H. (2019). Effectiveness of immersive virtual reality-based communication for construction projects. *KSCE journal of civil engineering*, 23(12), 4972-4983.
- Bel, M. (2018). BIM as a communication and collaboration tool for the design and operation phase of hospital buildings: A case study research into validating and verifying the design and BIM model by the project team and client & end-users.
- Bordi, L., Okkonen, J., Mäkineniemi, J. P., & Heikkilä-Tammi, K. (2018). Communication in the digital work environment: implications for wellbeing at work.
- Calderon, C., van Schaik, P., & Hobbs, B. (2000). Is VR an effective communication medium for building design?.
- Dermody, K. Modes of Digital Communication. Digital Citizenship Toolkit.
- Dubas, S., & Paślawski, J. (2017). The concept of improving communication in BIM during transfer to operation phase on the Polish market. *Procedia engineering*, 208, 14-19.
- Farghaly, K., Abanda, F. H., Vidalakis, C., & Wood, G. (2016). BIM for FM: Input versus Output data. Conference: Proc. of the 33rd CIB W78 Conference.
- Freestone, O., & Mitchell, V. (2004). Generation Y attitudes towards e-ethics and internet-related misbehaviours. *Journal of business ethics*, 54(2), 121-128.



## References

- French, J., McAvoy, A. (2021). Cybersecurity Risks and Prevention Strategies for the Construction Industry. Retrieved from: <https://www.pbmares.com/cybersecurity-risks-and-prevention-strategies-for-the-construction-industry/>
- Gaethofs, D. The future of data exchange in the construction and installation sector. Retrieved from: <https://www.linkedin.com/pulse/future-data-exchange-construction-installation-sector-danny-gaethofs>
- Gomez, L. M., & Soto, I. (2011). Social media as a strategic tool for corporate communication. *Revista internacional de relaciones públicas*, 1(2), 157-174.
- Jukić, D., Stantić, T., & Jozipović-Sudar, R. (2018). ANALYSIS OF BUILDING A CORPORATE BRAND IN CONSTRUCTION. *Young Economists Journal/Revista Tinerilor Economisti*, 15(31).
- Koutsogiannis, A. GDPR in construction: Are you prepared? Retrieved from <https://www.letsbuild.com/blog/gdpr-in-construction>
- Lou, J., Lu, W., & Xue, F. (2020, November). A review of BIM data exchange method in BIM collaboration. In *International Symposium on Advancement of Construction Management and Real Estate* (pp. 1329-1338). Springer, Singapore.



## References

- Mantha, B. R., & de Soto, B. G. (2019). Cyber security challenges and vulnerability assessment in the construction industry. In Creative Construction Conference 2019 (pp. 29-37). Budapest University of Technology and Economics.
- Nguyen, N. (2017). A tool for digital communication implementation in the marketing funnel.
- McPartland, R., Data exchange on BIM projects: What are data drops? Retrieved from: <https://www.thenbs.com/knowledge/data-exchange-on-bim-projects-what-are-data-drops>
- Park, S., Na, E. Y., & Kim, E. M. (2014). The relationship between online activities, netiquette and cyberbullying. Children and youth services review, 42, 74-81.
- Pham, T. (2015). Social media in employer brand communication: Focus on SMEs in Finland. Case study: Smarp Oy.
- Redding, H., (2021). Cybersecurity Challenges in the Construction Industry. Retrieved from: <https://www.tripwire.com/state-of-security/ics-security/cybersecurity-challenges-in-the-construction-industry/>
- Saarinen, J. (2016). Managing global virtual teams.
- Singh, S., Chinyio, E., & Suresh, S. (2018). The implementation of stakeholder management and Building Information Modelling (BIM) in UK construction projects.



## References

- Soler-Costa, R., Lafarga-Ostáriz, P., Mauri-Medrano, M., & Moreno-Guerrero, A. J. (2021). Netiquette: ethic, education, and behavior on Internet—a systematic literature review. *International journal of environmental research and public health*, 18(3), 1212.
- Takim, R., Harris, M., & Nawawi, A. H. (2013). Building information modeling (BIM): a new paradigm for quality of life within architectural, engineering and construction (AEC) industry. *Procedia-social and behavioral sciences*, 101, 23-32.
- TAŞDELEN, B., AYAZ, F., & COŞKUN, G. Social Media And Personal Branding: Journalists' Preferences For Brand-Shaping Practices. *New Approaches in Media and Communication*, 397.
- Ungerman, O. (2015). Social media as a marketing communication tool used by family firms. *Acta academica karviniensia*, 15(2), 148-162.
- Wen, J., & Gheisari, M. (2020). Using virtual reality to facilitate communication in the AEC domain: A systematic review. *Construction Innovation*.
- Woksepp, S. (2007). Virtual reality in construction: tools, methods and processes (Doctoral dissertation, Luleå tekniska universitet).



## Legal Notices

### **Disclaimer**

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

### **Licensed under Creative Commons**

This work is licensed under a Creative Commons Attribution – NonCommercial – Sharealike 4.0 International License.

