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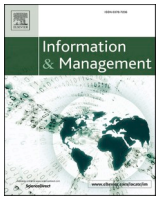

Maneuvering between skepticism and optimism about hyped technologies: Building trust in digital twins

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ABSTRACT

IT vendors' promises are likely to meet sound skepticism from prospective clients. If a particular technology is in vogue and seen as a "hype," clients are under pressure to buy the technology while, at the same time, skepticism about its claimed benefits might be reinforced. Finding a balance between optimism and skepticism is essential. In this qualitative case study, we examine how an oil and gas supplier company in Norway deals with different pressures when adopting and subsequently implementing digital twin (DT) technologies. DTs offer the promise of creating a digital representation of the physical assets that can keep production facilities operating efficiently and optimally and, as such, have been heralded as enabling the next frontier of productivity improvements. Our results reveal a set of different pressures promoting the decision to adopt the hyped technology. Yet, when descended to the local context, the hype status of DTs evokes multilevel perception segmentation that hype interpreters maneuver by building trust. Based on this analysis, we propose a framework of trust-building mechanisms that contribute to a more nuanced understanding of adoption of hyped technologies and enable practitioners to deal with hype-induced perception obstacles.

1. Introduction

This paper examines the challenges faced and the strategies required to adopt and implement hyped technologies in the oil and gas industry. A hype is understood as "emotionally charged, enthusiastic and unreasoned discourse," which characterizes the upswings in the adoption of some novel technologies [1,2]. The discourse surrounding hyped technologies focuses on the promotional material overestimating benefits and underestimating costs and the corresponding difficulty of implementing the technology [3–5]. This leads to inflated expectations and disillusionment, which ultimately results in failed attempts to adopt hyped technologies [6]. Despite the widespread attention researchers and practitioners have given to hyped technologies [2,7–9], research into the impact of hype status on the implementation and perception of such technologies across different organizational levels has been limited. The aim of this study is to explore this gap by examining how one organization within a specific industry dealt with the adoption of a hyped technology: digital twin technology. Digital twins [10,11] are defined as "a virtual representation of a physical system (and its associated environment and processes) that is updated through the exchange of information between the physical and virtual systems" [12]. Over the last few years, digital twins have been promoted as a panacea for many of the challenges facing the oil and gas industry. Nevertheless, expectations regarding the value of digital twins remain unfulfilled [11,13].

Scholars exploring hyped technologies often refer to the hype curves presented by Gartner [11] one of the most influential promissory organizations shaping the business of technological expectations [14]. Gartner identified digital twins as one of the top 10 strategic technology trends for several consecutive years [15] and placed this technology at the top of the hype curve in 2017 and 2018. Mirroring the Gartner Hype Curve, digital twins are marketed as an "urgent priority" technology that can deliver a competitive advantage to organizations in the oil and gas

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supply chain [16]. The oil and gas industry relies heavily on the efficient operation of key physical assets. Digital twins have thus emerged as a promising technological solution for building virtual copies of actual plants that can be used to optimize operations. Digital twin technologies are a conceptual rebranding and incorporation of technologies for the integration of data (e.g., operations data, test data), simulation models, and structural information (design drawings, engineering drawings, and equipment specifications) related to physical assets [17]. These hyped technologies add value by enhancing the visualization of all relevant metrics typically displayed on 3D models, streamlining data integration, particularly of sensors and devices in offshore engineering, and improving collaboration by providing a unified platform where stakeholders can communicate and access relevant information [15]. As a result of the promising hype discourse, many organizations in the oil and gas and other manufacturing industries have adopted or are in the process of adopting digital twins [18–22]. Hence, a digital twin is a good example of a hyped technology in which inflated vendor promises must be managed by customer firms to obtain business value. This justified skepticism is reinforced by a history of surprisingly low [11] adoption of digital twins in the oil and gas industry, which has seen several projects fail to deliver the expected outcomes [23,24]. It is thus instructive to use digital twins to examine how and why organizations in the oil and gas supply chain adopt hyped technologies and how hype impacts the trust required for the adoption and exploitation of new technology.

The study of hyped technology adoption is not new. Prior studies focused on technologies such as big data analytics, the Internet of Things, and electric vehicles [25–27]. One recurring finding in the literature is that each digital technology and industry has a specific, unique set of pressures that motivate adoption as well as a unique set of challenges associated with diffusion and value generation [28,29]. One of the limitations in the literature examining the adoption of hyped technologies is that there is little differentiation between the perception of pressures and the way they are acted upon at different organizational levels [30]. In practice, there are often friction and competing pressures between different levels within an organization, from top management to domain experts, operational personnel, and IT staff [31]. This friction must be overcome in order to build the trust between parties that is required to generate business value from novel technologies [32].

In this paper, we draw on two streams of literature that can shed light upon the adoption of hyped technologies. First, we draw on the emerging literature regarding the consumption and production of management ideas, with a particular focus on their popularity or hype status [3,5,33]. Here, we aim to understand the motivations and narratives that top management and other key organizational actors develop when adopting and implementing new concepts. Since adopting hyped technologies follows many of the same motivations as introducing new concepts, this body of knowledge can provide insights into how digital twins are perceived at different levels within organizations and how they are legitimized, adopted, and put to use.

The second stream of research focuses on the role trust building plays as a central antecedent of widespread adoption [34–36] because trust conveys individual perceptions about the characteristics of a hyped technology [37]. This research stream considers implementation as a dynamic, interactive process at different organizational levels. Thus, implementing digital twins becomes a purposeful dialogue during which trust must be actively pursued to overcome perceptions of uncertainty related to hyped technologies [35,36]. Although extant research contends that organizations suffer from a lack of trust in hyped technology, data, and technologists [38], there is a lack of consensus regarding the impact of hyped status on perceptions of and trust in technology [39, 40].

In summary, this research attempts to answer the following research question:

How does the hyped status of digital twins affect the adoption and perception of this technology in the oil and gas industry?

To answer this question, we conducted a qualitative case study examining the early adoption of digital twins in an oil and gas systems provider company and one of its customers, a mid-sized oil company. This paper explores the pressures that prompt the adoption of the hyped digital twin technologies with an ambition to understand how perceptions and trust are built at different organizational levels to legitimize adoption. Our results show that the hype status of digital twins triggers perceptional ambiguity that hampers the implementation of and building trust in this hyped technology. We unveil empirically how interpreters maneuver what we call *perception segmentation* referring to a skepticism–optimism perception nexus at different organizational levels. In so doing, interpreters develop a more realistic, "de-hyped" understanding of the benefits of digital twins and build trust in the hyped technology. Based on this analysis, we propose a framework of trust-building mechanisms that can help organizations build trust in hyped technologies such as digital twins.

The remainder of the paper proceeds as follows. In the next section, we provide a synthesis of the work on adoption of digital twins, followed by an overview of two literature streams on which we ground our theoretical foundation. Section 3 introduces the research case and the study design, along with the data collection process. Sections 4 and 5 provide a structured presentation of our research results, followed by a discussion on the theoretical and practical implications, limitations, and avenues for future research.

2. Background

To understand the process through which organizations decide to adopt novel hyped technologies, we first briefly sketch out the characteristics of digital twins and its expected business value within the oil and gas industry. Through this overview, we attempt to understand the motivations of stakeholders at different organizational levels and the corresponding pressures that influence adoption. Thereafter, we briefly outline two research streams to provide a theoretical framing for such pressures and establish a consolidated view of digital twins. We draw on the literature on management ideas, which provides insight into how organizations deal with conflicting pressures regarding the legitimacy of adopting hyped technologies such as digital twins [5,9]. We further expand on the literature about trust to understand the process through which the stakeholders at different organizational levels achieve a common vision and mutual understanding of the value of digital twins [34,42]. It is essential to notice that the outlined research streams were not used ex ante during the study design, data collection, or early coding process but rather abductively "earned their way" [43] into our interest during data analysis through their empirical relevance.

2.1. Digital twins in the oil and gas industry

Several authors have observed the ambiguity in the term "digital twin" that has become a prominent buzzword [44]. The conceptual labeling gradually evolved from the initial idea of product lifecycle management to concepts of mirror worlds, the mirrored spaces model, the information mirroring model, and, finally, digital twins—a term coined by NASA in 2010 [45]. Singh et al. [45] descriptively defined digital twin as "a dynamic and self-evolving digital model or simulation of a real-life subject or object representing the exact state of its physical twin at any given point of time via exchanging the real-time data as well as keeping the historical data. It is not just the digital twin which mimics its physical twin, but any changes in the digital twin are mimicked by the physical twin too." The expanding hype discourse has resulted in an increasing variety of definitions of digital twins that threatens the implementation of the technology [12,46].

Since 2014, the digital twin technology has undergone a phase of rapid growth [47]. This phase has been accompanied by the increasing hype of the technology popularized by academics, the business press (e.g., Forbes [48]), conferences, and leading consultancies (e.g., Gartner [49], McKinsey [50], BCG [51]). Adoption of digital twins within the oil

and gas industry has been popularized through presentations by consultants and vendors who present the potential value and competitive advantages such technologies could offer. Specific use case that supports these arguments includes improved ability for predictive maintenance, increased transparency on physical asset conditions, reducing the need for full-time personnel with specialized knowledge to be located on physical plants, and minimizing the cost related with travel and field operations [46,52]. In offshore operations, digital twins are argued to bring efficiency gains for all parties (e.g., clients, fabrication, offshore operator) by transforming all project phases and bringing the human factor into the engineering loop early in the project life cycle, which is currently lacking in conventional technologies [52]. This capability of digital twins has been one of the key aspects of its popularity within the oil and gas industry.

Despite the recognized potential value from digital twins in the oil and gas industry, organizations are still struggling to adopt such technologies and generate value [46]. This mismatch between claimed value and actual adoption levels has been attributed to conflicting perceptions at different organizational levels regarding the benefits of assimilating digital twins into operations [53]. Despite this perception ambiguity, much research on digital twins remains conceptual and is associated to the engineering and computer science fields, while work in the information systems domain remains at an initial stage [46].

2.2. Adoption of hyped technologies: literature on management ideas

While the literature on technology adoption is dominated by rationalistic thinking and largely disregards adoption of hyped technologies [3], the literature on management ideas can provide valuable insights into the motivation of organizations and individuals to adopt and accept hyped technologies. A body of literature on management ideas has emerged since the late 1980s [33,54]. This research stresses the commercial and cultural nature of introducing new concepts and ideas and emphasizes that adopting them involves much more than just rational decision-making [55]. This stream of research emphasizes that an idea's advocates have vested interests in emphasizing its benefits and downplaying potential pitfalls. As a result, they create and/or promote "rationalized myths" [56] and thereby build pressure on potential customers to buy their idea. In the case of digital twins, such idea advocates are typically vendors of solutions, popular press, consultancies, industry forerunners, and early adopters [54,57]. Jointly, they prompt a series of pressures on focal firms to adopt hyped technologies [58].

The literature on management ideas incorporates insights from neo-institutional authors and stresses that individuals within organizations are motivated to comply with external pressures. DiMaggio and Powell [59] distinguish between four pressures forcing organizations to resemble each other in terms of technological structure. *Competitive* pressures stimulate organizations to imitate others to maintain or improve their competitive positions; *coercive* pressures stem from external actors (e.g., customers, suppliers, the state) and may leave the organization under pressure with little choice but to conform; *mimetic* pressures refer to imitating other seemingly successful organizations whereby the imitators assume that the successful organizations know best; and *normative* pressures are associated with norms prevailing in different professions that predefine issues such as work conditions, methods, and behavioral standards [32,60,61]. These pressures can help explain a strong interest from organizations in the oil and gas industry in adopting digital twins as well as shed light on how different pressures affect different levels within the organization [62].

To increase the chance of large-scale adoption [3,63], hyped technologies need to be presented in ways that appeal to their target audience. One key aspect of this appeal is what has been coined as "interpretative viability" [64], which essentially refers to the ambiguity of hyped technologies that can lend themselves to multiple interpretations. Hyped ideas offer an "interpretive space" [65] allowing a range of interested actors to buy into the idea, each for their own particular reasons. This holds *in extenso* for technologies that tend to be appropriated by their users to suit different purposes [66,67]. Thus, potential adopters may construct their own perceptions of a novel technological solution and accept, shape, and embrace it based on their own interests [54,64]. Hence, it is important to understand how different levels of personnel (e.g., top management, domain experts, and technical staff) within oil and gas organizations experience the deployment of the hyped digital twin technologies and how they reach a perceptional consensus on such technologies. Scholars call for further empirical inquiries exploring aspects and consequences of adopting hyped technologies [2,5,9,68,69] because despite the persuasive hype discourse and acknowledged opportunity to gain internal and external legitimacy by following the "hottest" IT trends [5], hyped technologies often encounter a paradox of low deployment [68].

2.3. Trust and trust building in hyped technologies

Trust is a concept that has been at the core of management and information system scholarships for decades [70,71]. It is often defined as the "willingness of a party to be vulnerable to the actions of another party" [72]. In its essence, trust and trust building hinge on familiarity and familiarization (a process of gaining familiarity), which are grounded in past experiences with a technology or a person and extend them to the future [73]. Considering the essence of familiarity, recent scholars have emphasized the importance of trust in technological structures [39,40,74], interaction with which represents a "trust leap" between "known" and "unknown" [75]. Trust helps individuals encountering hyped technologies such as digital twins overcome perceptions of uncertainty related to such technologies [35].

Scholars claim that trust is profoundly affected by technological trends that necessitate rethinking trust in "smart," often overhyped technologies [40,76]. In contrast to traditional technologies that gradually grow in popularity [77], hyped technologies engender swift technological adoption, bypassing gradual familiarization. Despite the presumed impact of technological hype on trust, it remains unclear how trustful beliefs in established technologies vary from trust in hyped technologies. Åm [78], for example, argued that conceptual and empirical approaches to trust in hyped technologies should be revisited. In the case of digital twins, there is ample research and anecdotal support that indicates that it is precisely this lack of trust in the technology that eventually results in the demise of deployment efforts [79].

Understanding how trust is established across different organizational levels during implementation of digital twins in the oil and gas industry is suggested to be a key antecedent to routinizing such technologies in operations and ultimately realizing value from them [80,81]. Hence, aside from understanding the specifics of trust in hyped technologies, it is critical to pragmatically [42] approach them in order to understand how local stakeholders can navigate perceptional obstacles [69] and build trust in them. Amid the limited body of work on trust building in hyped technologies, Yu et al. [2] found that complex trust building is an underlying mechanism of how an organization accepts and diffuses hyped technologies. Nevertheless, neither Røvik [42] nor Yu et al. [2] explicitly theorized trust-building mechanisms in hyped technologies. This represents a research gap with respect to how employees' distrust and fears related to hype can be overcome [82].

In this paper, we do not measure trust (e.g., competence, benevolence, and integrity [72]) but rather qualitatively examine various perceptions of the hyped technology across different organizational levels as well as practices through which interpreters construct individuals' confident perceptions that a hyped technology has attributes beneficial for trustors [35].

3. Methodology

The current research adopts a qualitative case study research design [83] to problematize and develop theoretical ideas regarding the

implementation and perception of hyped technologies.

3.1. Case selection

We conducted a qualitative case study to explore the role of hyped digital twin technologies for cross-boundary knowledge collaboration in the oil and gas value chain in Norway. This study examines a multinational system provider that delivers subsea solutions for the oil and gas industry (anonymized as OGSP: Oil and Gas System Provider). In 2021, OGSP operated in 41 countries with more than 20,000 employees, including 2000 in Norway. As of about 2016, OGSP experienced increased pressure on digitalization, including the loss of several bids due to a perception of insufficient digital capabilities and strategy. Resulting from this pressure, OGSP started a digital twin program in 2018–2019 and established a dedicated digital twin team. Through implementing digital twins, OGSP sought to increase efficiency of the value chain, from design to decommissioning.

As OGSP intends to offer digital twins to both internal and external users, the study focused on multilevel perception of digital twins, not just internally in OGSP but also at one of OGSP's customers (a medium-sized oil company anonymized as OGO: Oil and Gas Operator). In 2021, OGO operated in eight countries with 1400 employees, of which around 300 were based in Norway. These two companies had a long history of collaboration in several projects, including OGO's early engagement in OGSP's development initiatives such as digital twins.

At the time of data collection, OGSP was developing and scaling the first wave of digital twins-based applications. We particularly focused on one digital twin-based application for field development. This application aimed to accelerate the concept selection process that included evaluation of 80 or more different technologies for one project. In this digital twin-based application, the user and graphical interfaces brought OGSP's and customer's experts into one digital environment where they could configure solutions, perform calculations and analyses, and co-design the field layout in real time. This application was successfully tested in more than 25 front-end studies in 2019 but was still in the scaling-up phase during the data collection. During the initial data analyses, we observed that local actors struggled to implement digital twins, as well as respondents struggled with judging the pros and cons of digital twins, which were ambiguously perceived as a hype. This led to our focus on why implementing a hyped technology is problematic and how implementers cope with conflicting perceptions.

3.2. Data collection

Applying inductive reasoning, the study started with observation and information meetings to frame the research focus and conceptual framework [84]. Data collection occurred from May 2019 to August 2021. By giving voice to informants [85], the first explorative stage of data collection (May 2019–August 2020) delved into digitalization of knowledge collaboration in the oil and gas value chain, where digital twins first came into the study's focus as a promising example of transforming technologies. Our early observation of the ambiguous perception and challenging adoption of this hyped technology spurred our focus on digital twins in the second stage of data collection (November 2020–August 2021).

To ensure an in-depth understanding of the research phenomenon, we applied method and data triangulation (see Table 1 for details). As a part of an industrial collaboration agreement within the research program, the first author started initial data collection with information meetings, followed by visits to the companies' sites that the contact persons arranged during the initial research stage. We also joined three industrial discussions on digital twins, where OGSP was among the discussants. Additionally, we studied digital twin discourse through internal documents (e.g., presentations) and the companies' websites and social media platforms (e.g., LinkedIn). Notably, interviews served as the main source of data on the adoption, implementation, and awareness processes, with document data serving as a supplementary source for gaining additional perspectives on key events and sensegiving to digital twins.

Table 1
Overview of research data.

	Type of data	Details
Primary data sources	Interviews	***First stage of data collection***
		• Management & commercial: 4 individual interviews (OGSP), 3 individual interviews (OGO) • Engineers: 16 individual and 1 group interviews (OGSP), 9 individual interviews (OGO) • Digital leaders: 4 individual and 3 follow-up interviews (OGSP) • Digital twin team: 2 group interviews (OGSP) • Other: 2 individual interviews (OGSP)
		Second stage of data collection
		• Management & commercial: 1 individual interview (OGSP) • Engineers: 3 individual interviews (OGSP), 1 individual interview (OGO) • Digital leaders: 4 individual and 4 follow-up interviews (OGSP) • Digital team: 5 individual interviews (OGSP), 1 individual interview (OGO)
	Information meetings	• Two meetings with OGSP's digital leaders • One meeting with an OGSP's digital leader and OGO's engineering and commercial experts
	Observation	• One OGSP's leader meeting • Three visits to the companies' sites
Secondary data sources	Industrial discussions	• French–American Chamber of Commerce discussion "AI & Energy Industry" • DNV panel discussion "Digital twins–Are they valuable? Can you trust them?" • "Big Data Industry Summit Oil and Gas"
	Other Sources	• Six presentations on digital transformation and digital twins • Websites, LinkedIn

We conducted 62 semistructured individual and group interviews, thereby obtaining retrospective and real-time accounts from various stakeholders. Our research sample was based on purposeful sampling and snowball techniques and took the form of "seeking maximum variation" in order to elucidate contrasting perceptions [86]. As a result, the research sample included participants of different genders, nationalities, job positions, organizational sites (primarily Norway, and also including France, the US, and the UK), and work experience (from 3 to over 40 years). In particular, our sample comprised three main groups: (1) *managers:* top- and middle-level managers and commercial specialists; (2) *domain experts*: engineering leaders (e.g., project director, director front-end, and system engineering management) and engineers; and (3) *technologists*: digital leaders (e.g., chief digital officer, head of innovation and digital partnering, digital transformation director) and digital team members (e.g., digital portfolio manager, digital product designer, data analyst, software developer, product marketing communication manager). Since these actors actively constructed and impacted perceptions of digital twins in the organizations, they were seen as key actors in the adoption and (non-)deployment of the hyped technology.

Interviews were conducted face-to-face, over the phone, and via video communication platforms (e.g., MS Teams, Zoom, Skype) and email. They ranged in length from 45 min to 2.5 h, with 1.5 h on average. All interviewees were provided with an information letter and a preliminary research guide that was often adjusted to interviewees' experience and positions and the maturing research focus. Interviews started with open questions on interviewees' experience with collaboration and digitalization of (customer–supplier) project relations. Then

we proceeded with more specific questions on perceptions, expectations, struggles around digital twins, and interpretation practices. Interviews at the later stage of data collection served to (dis-)confirm some observations and clarify contradictory beliefs, such as (non-)inclusive customer engagement in development of digital twins and (dis-)similar needs for digital twins in the customer–supplier context. In agreement with informants, this paper anonymizes all quotes to avoid disclosing informants' identities [company name, informant's realm (M: managers and commercial specialists, D: domain experts, T: technologists), randomized interviewee number]. For example, OGSP M.1 refers to an OGSP's manager.

3.3. Data analysis

The research data amounted to 83.5 h of audio recordings. These were transcribed verbatim due to the specifics of the oil and gas jargon and to avoid obstructing preconceptions [87]. To "recontextualize" the extensive research data, transcripts were further analyzed using the qualitative data analysis software NVivo 20. Applying the Gioia methodology as an analytical device [88], we structured the research data along with multiple data-anchored first-order concepts (those meaningful to the interviewees) that were further structured into theory-anchored second-order themes (induced by the authors). Our data analysis further abductively unpacked three aggregate dimensions related to the research question: pressures promoting adoption of hyped technologies, segmented perception of hyped technologies, and trust-building mechanisms (Fig. 1). We offered labels of the aggregate dimensions either by encapsulating dimensions at a higher level of abstraction or by referring to established literature describing these themes [85]. To increase the rigor of this qualitative research, we seek to provide transparency to our data structuring process. Tables 2–4 provide illustrative examples of how we progressed from raw data to first-order concepts and second-order themes. Table 3 also shows the segmented perception of digital twins among three groups of individuals in the organizations: management, domain experts, and technologists.

4. Research results

This section first presents our findings on pressures fostering digital twins' adoption in OGSP, followed by the results on segmented

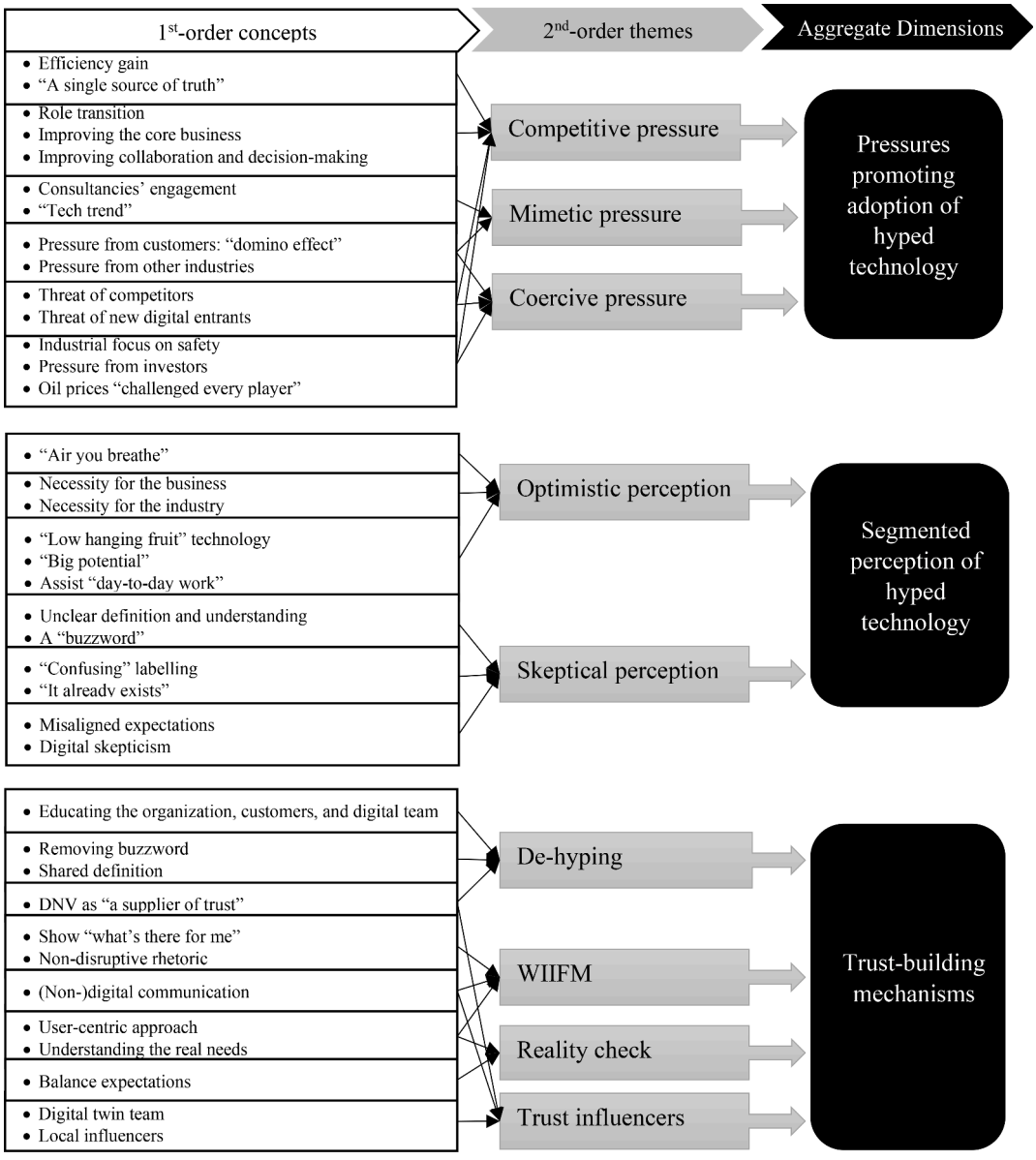

Fig. 1. Data structure.

Table 2
Extract of the structured data analysis on pressures promoting digital twins' adoption.

Illustrative quotes	Adoption arguments	Adoption pressure
The first [digital twin-based] application … started with dialogue with [Name of a large oil company]. They had very poor visibility of their equipment … And from there, it's anchored into the business … to get efficiency gain. (OGSP T.24) *[Digital twin] creates an ecosystem to enable critical data flow from the cradle to the grave across the entire lifecycle of the project. This ecosystem allows every stakeholder, whether it's internal OGSP stakeholders or client stakeholders, to look at the same single source of truth and improve decision-making. (OGSP T.51)*	•Efficiency gain •"A single source of truth"	Competitive pressures
We know we need a [digital twin-based] software to read the data and give some flow advice … So, the advisor role is really the strategic position that we need to take … Digital twin is part of it. (OGSP M.4) *His [the CEO's] argument was that he knew this [digitalization] was a change that was going to impact the way we do business. (OGSP M.38)* *Digital twin environment will be the necessary way for us to do business … It forces us to address the inefficiencies we have as an organization around how we communicate, how we use and store data, and how we engage with our customers. (OGSP M.25)* *Recent development in digital technology has enabled us to use digital twins for more advanced decisions. (OGSP T.18)*	•Role transition •Improving the core business •Improving collaboration & decision-making	
They [consultants] talk to the senior leaders who, maybe, have less time to really understand the problems … They [senior leaders] really want a simplified message. (OGSP T.24) *The driver is a tech trend …We're doing it because everyone is doing it. (OGSP T.57)*	•Consultancies' engagement •"Tech trend"	Mimetic pressure
Sometimes what you need in the industry is just a spark … You need one big player to say, "this is what we want to do." And then it's a domino effect from there. So, once companies like Shell and BP said, "we are going to do this," it was almost like it ignited the entire industry. And then, all of a sudden, everyone is doing it. (OGSP T.51) *If you look at the aviation industry—Boing is doing it [digital twins] with gas compression turbines … There're a lot of good examples in other capital-intensive industries of where digital twin is becoming more commonplace. (OGSP M.25)*	•Pressure from customers: "domino effect" •Pressure from other industries	
All players are developing digital twins. Major oil and gas companies … [and] the three largest subsea contractors–all with an ultimate goal to build an end-to-end digital platform from field development to services. (Internal documents) *It was very clear that potential was there and that if we don't provide it, there will always be a risk that they [digital companies] come into part of our value chain and capture a potential … Strategically, quite important. (OGSP T.26)*	•Threat of competitors •Threat of new digital entrants	
It's a safety-conscious industry … Digitalization has offered a unique ability to address safety in a very different way. There're digital representations of entire offshore refineries and plants as well as offshore rigs and vessels that tell you where every valve is, what the status of every equipment is … So, there is a big advantage in … keep[ing] people out of harm's way. (OGSP T.51) *Wall Street and investors are saying, "if your annual report doesn't clearly demonstrate how you're going to reduce carbon emissions, we will not invest in you" … Digitalization in the oil industry is very similar. (OGSP T.51)* *The current business climate is making digitalization a necessity and not a luxury. When oil prices were $100 a barrel, there was no motivation to adopt new ways of working … [Then] it was a downturn … and with COVID this year—oil prices went negative for the first time in history. It has challenged every player in the industry … to think deeply about how we survive. (OGSP T.51)*	• Industrial focus on safety • Pressure from investors • Oil prices "challenged every player"	Coercive pressure

perception and trust-building mechanisms through which local implementers maneuvered between conflicting perceptions of digital twins.

4.1. Pressures promoting adoption of digital twins

While studies on management ideas often neglect competitive pressures [89], our data analysis revealed several intertwined competitive and institutional pressures fostering the decision to adopt the digital twin technology in OGSP. Table 1 depicts the most prominent pressures.

4.1.1. Competitive pressures

OGSP's initial focus on digital twins emerged in dialogue with a large US-based oil company that had poor visibility of its equipment. Data about the status of the equipment was not easily accessed by operators and management. In collaboration with this customer, OGSP created the first version of digital twin-based application that stayed anchored in OGSP's business to gain efficiency on a larger scale. Digital leaders emphasized that OGSP intended to develop digital twins as an ecosystem to enable the data flow "from the cradle to the grave" in the value chain. This allowed OGSP and its customers to look at the "single source of truth" to make data-driven decisions and promptly respond to equipment issues.

At the top management level, digital twins were associated with a strategic goal of new ways of doing business, such as OGSP's long-term goal of transitioning from being a service provider to being an advisor. However, managers stressed that the goal of digital twins was not to create new business models or products but rather to improve the core subsea and surface business. Managers and digital leaders added that adopting digital twins was supposed to address defects in project work, such as inefficiencies around communication, customer engagement, and data.

4.1.2. Institutional pressures

Our data analysis further unveiled prominent institutional pressures fostering the adoption of digital twins in OGSP. The digital twin journey in OGSP started in collaboration with a consultancy that assisted OGSP in identifying the scope and value of digital twins for the company and its customers. Digital leaders, however, critically remarked that although the consultancy's engagement provided credibility to the solutions, consultants talked mainly to senior leaders who wanted a "simplified message." Moreover, several OGSP's managers accentuated that the adoption of digital twins was mimicked and coerced by the ongoing technological trends in the oil and gas and other capital-intensive industries, such as aviation, where automation and visualization had become commonplace. OGO's informants also underlined that the ubiquitous digital discourse in the industry engendered their digital requirements, including digital twins, to OGSP. Thus, oil operators' mimetic dictation of technological trends coercively descended to suppliers.

Interviewees and industrial discussions revealed that several major oil companies and three largest subsea suppliers, including OGSP, pursued the goal of building an end-to-end digital platform from field development to services. Therefore, OGSP's top management felt coerced by the hyper-competitive oil and gas market environment to adopt new hyped technologies: "*not embracing it [new digital realities] means being left behind*" (OGSP M.38). Several digital leaders also remarked that OGSP was trying to "ride that wave" led by digital companies, such as Amazon Web Services, Microsoft, and Aveva. These coercive drivers were also competitive as they were held to secure OGSP's competitive advantage.

Our data analyses also show that the oil and gas industrial environment coercively advanced digital twins' adoption. By pursuing the industrial focus on safety, OGSP could reduce the number of personnel offshore and keep people out of harm's way by automating several tasks in digital twin technologies. Digitalization and carbon footprint

Table 3
Extract of the structured data analysis on segmented perception of digital twins.

	Illustrative quotes	Arguments	Perception segmentation
Man	*[Digital twin] is just part of the air you breathe … You can choose to describe it as a buzzword, or you can use the opportunity of it. (OGSP M.38)*	• "Air you breathe"	
Domain experts	*[The industry] depends on [digital twins] … [In a] subsea development project, you have, let's say, 200,000 engineering hours … By parameterizing the models … we can get it down to 400 or 500. (OGSP D.34)*	• Necessity for the industry	Optimistic perception
	Digital twin is … kind of a low-hanging fruit because we have the 3D model and … the data. So, it's more to combine those into something more visual and real-time. (OGSP D.14)	• "Low hanging fruit" technology	
	Big, big [potential of digital twin]. In the future, we should have a digital twin containing all information, like all engineering documentation, 3D models, test data, pictures, manufacturing records—everything. (OGSP D.20)	• "Big potential"	
	[Digital twin] would help my day-to-day work … I can just say to people, "there is a live database we're using. Go [and] find the information yourself." … Then, people are more self-driven. (OGSP D.45)	• Assist "day-to-day work"	
Technologist	*We're not using digitalization because it's a fancy thing. It … helps us to do our core business better. (OGSP T.51)*	• Necessity for the business	
	Digital twins may focus on a very small and isolated problem … [such as] digital representation of a facility or complete work process like well planning or field planning because it is several specialized applications that work individually but could also work together. (OGSP T.18)	• Necessity for the industry	
Managers	*There're a lot of definitions of what the digital twin is, from our customers, from regular bodies, from us, and from our competitors. (OGSP M.25)*	• Unclear definition	
	If I use an analogy—so, it is much more going on in the kitchen, that we see in the oven, than the one you see on the plate … And sometimes you get disappointed compared to what you've read on the menu. So, you get less from the tools than you hoped them for. (Industrial discussion)	• Misaligned expectations	
Domain experts	*I don't know what that [digital twin] means … I don't understand what we're doing … It's a buzzword. (OGSP D.45)*	• A "buzzword"	Skeptical perception
	The naming convention or the brand name we have on it [digital twins] could be a bit confusing. (OGSP D.12)	• "Confusing" label	
	But it [digital twins] already exists. For sure, it is a buzzword in the market today. (OGO D.10)	• "It already exists"	
	I think that is a wrong word—digital. We've been digital for many years. (OGSP D.11)		
	We don't understand why we should digitalize, and even less how. (OGSP D.45)	• Digital skepticism	
	[Digitalization is] not kind of a natural talent for a mechanical engineer. (OGSP D.34).		
Technologists	*We've been working for about a year on these digital twins … to understand them. But we haven't yet … It's one of those projects that takes a lot of complexity, a lot of stakeholders, opinions, prospects, etc. (OGSP T.37)*	• Unclear definition and understanding	
	[Digital twin] is really a buzzword. I think in OGSP, people don't know. It just sounds very nice [laughs]. (OGSP T.59)	• A "buzzword"	
	Digital twin as a concept is fluffy and fuzzy. And I'm not sure if we will ever sell a product that kind of, "this is our digital twin." (OGSP T.54)		
	[The] oil and gas industry has used digital twins for a long time but under different names—model-based optimization, reservoir models, process simulation, 3D models, structural re-analysis systems. (Industrial discussion)	• "It already exists"	
	Let's figure out the term digital skepticism. People are afraid of change … especially in this industry. (OGSP T.42)	• Digital skepticism	
	I don't think digital twin itself will remove engineering hours … because every project is specific, and it's a complex industry. And I don't believe digital or data will kind of replace humans. (OGSP T.42)		

reduction also became a "must-have" for investors and thereby a matter of survival in the industry. Here, a central argument was that the 2019 oil price fluctuation made digitalization a necessity, not a luxury.

4.2. Segmented perception of digital twins

We further observed that the complexity of these pressures created several implementation obstacles, among which conceptual ones protruded in all interviews and industrial discussions. Technologists listed challenging alignment of expectations, ambiguous understandings, and distrust as central conceptual pitfalls for implementing digital twins: "*It's easy to discuss [digital twins] as a broader terminology, but when you actually start diving into the material, it's hard to define exactly what the digital twin is and why you need it*" (OGSP T.54).

Table 2 illustrates divergent and segmented perceptions of digital twins among central groups of individuals (i.e., managers, domain experts, and technologists). From early interviews, we observed that OGSP's and OGO's interviewees' perceptions of digital twins ranged significantly from the "air we breathe" to "just a big word." Perception ambiguity was, to some extent, grounded in the interviewees' technological frames and first-hand experience with digital twins. Managers, technologists, and engineers involved in digital twin development were fairly optimistic and pointed out that digital twins were "not just [a] hype" but rather an umbrella term with specific systems. Technologists and engineers involved in digital twin implementation also perceived this hyped technology as necessary for the industry and the business due to its ability to provide time and technical efficiency and unease day-to-day engineering work by making people more self-driven. Some experienced engineers also optimistically perceived digital twins as a "low-hanging fruit" technology with big potential considering its ability to optimize production by combining available data and technology into something more visual and real time.

In contrast to these optimistic perceptions, other OGO's and OGSP's interviewees, particularly domain experts, were less aware of the concept and its potential contribution. The lack of a clear understanding and a shared definition of digital twins as well as low trust in digital twins was stressed by all interviewees. For example, an engineering manager argued that people struggled to trust "black-boxed" digital twins technologies because they did not understand "what's happening underneath the hood." Another prominent point of skepticism among engineers was the ambiguity of the digital twin concept that was often referred to as "a trendy thing to do" or "a buzzword that just sounds very nice." Several domain experts and technologists, confusingly, referred to digital twins as something that already exists but under different labels, such as model-based optimization or 3D models. The negative connotations of the "digital twin" and "digitalization" labels also created an extra level of confusion and ambiguity among engineers. We observed that the unending pressure on digitalization increased digital skepticism among engineers who often felt "fed up" with digitalization, which was seen as not a natural talent for mechanical engineers. Interestingly, although technologists recited skepticism about digital twins as the main implementation obstacle, we also observed a level of skepticism about digital twins among technologists. Technologists repeatedly referred to this hyped technology as a "fluffy and fuzzy" concept unable to replace humans in complex project-specific work, as well as they skeptically perceived OGSP's ability to deliver digital twins as a product.

From the customer perspective, hype around digital twins complicated their understanding of which solution is best and why customers needed it in the first place: "*The issue with quite a lot of new tools that are coming up, [is that] they're solving some problems that we don't have*" (OGO

Table 4
Extract of the structured data analysis on trust-building mechanisms in hyped technology.

Illustrative quotes	Practices	Trust-building mechanisms
[Digital twin team] is educating the organization on what digital twin is. It's right now a big buzzword … But what does that mean? Especially to an operator or an engineer or somebody who works on the shop floor. (OGSP T.55) *It's really about understanding the technology … So, I was reading a lot, talking with people who had worked for a bit longer than me, and also exploring what other companies are doing. We have some consultancy companies to help us. (OGSP T.24)*	•Educating the organization, customers, and digital team	
Digital twin has been a hot topic for many years … [But now], when talking about digital twins, we can't talk about these high, floating words and "what is digital" anymore … We see that those who talk about digital twins on a very high level without much substance are not believed as partners in the digital realm. (OGSP T.56) *A year ago, we had maybe six or seven different understandings of digital twins … around the company, and that became just a mess. So, you need to orchestrate it … [to] have a direction. (OGSP T.18)*	•Removing buzzword •Shared definition	De-hyping
DNV needed to claim a … position in this world of digital twins. They've always been sort of a supplier of trust. (OGSP T.18) *When we're developing complex hardware, it helps to have trust with the clients that we're doing the right things. But when it comes to digital, there was not such a standard … That's why the work with DNV was really key. (OGSP T.24)*	•DNV as "a supplier of trust"	
It's more important to show what you'll gain … rather than go around in theoretical definitions of what it is, what DNV thinks it is, what McKinsey thinks it is. "What's there for me?"—that's the question we have to answer. (OGSP T.57) *In the oil and gas industry, disruption is not a positive word … So, do not focus only on disruption. (OGSP T.18)*	•Show "what's there for me" •Non-disruptive rhetoric	WIIFM
It's really key not to underestimate the messaging, especially because it [digital twin] is a little bit complex, … more abstract, and what the benefits will be is a little bit hard to quantify. (OGSP T.24) *If we talk about channels, it'll be on our website, … social media, … general media, interviews … [But] we need to think differently … The effect of trade shows isn't as good as it used to be … Targeted communication is the way to go. (OGSP T.56)*	•(Non-)digital communication	
Each time we develop the capability, we try to do it with a tangible use-case to avoid developing technology of technology. (OGSP T.49) *We try to speak to as many people as possible, both internally and on the client side, to understand … what's really we're trying to solve … It has been hard to engage with the clients and understand what they want and what they need. (OGSP T.24)*	•User-centric approach •Understand the real needs	Reality check
We can create a super good product, but since it's not exactly what people expected, they might not want to pay for it or want to use it … In this industry, there's a lot of skepticism about radically transforming towards digital. (OGSP T.55) *Per definition, the need for a digital twin internally isn't the same as the need for a digital twin from a customer. (OGSP T.48)*	•Balance expectations	
It [creating trust in digital twins] is all related back to the core digital twin product team. (OGSP T.56) *It's also about personal relations: who built it? Can I trust that guy or girl? It's not just a random IT guy that doesn't know anything about flowlines. (OGSP D.34)* *We talk about how to trust the twin … I've seen practical examples where digital twin [wa]s probably ok, but too little effort [wa]s spent on … preparing the people who are going to use it in practice. (Industrial discussion)* *We have very varying results based on whom we're interfacing with in the business … Some are … burning for that change. They have some sort of credibility within their part of the business, which means that if that person comes with something, then the other people will accept it or at least try it. (OGSP T.37)*	•Digital twin team •Local influencers	Trust influencers

D.3). During one of the industrial discussions, customer interviewees used an appealing "kitchen analogy" referring to misaligned expectations and reality when encountering the hyped digital twin technology.

4.3. Interpreting digital twins through trust-building mechanisms

OGSP's managers and technologists emphasized the necessity to overcome these perceptual obstacles and develop a thorough approach to interpret digital twins. Remarkably, trust was seen as a "cornerstone" of implementing digital twins in the local context: "***We needed this trust acknowledgement from customers. Otherwise, our product [digital twins] wouldn't be, you know, of much value***" ***(OGSP T.18)***. Although there was no corporate-wide strategy for building trust in digital twins, our data analyses revealed four prominent trust-building mechanisms (see Table 4 for details).

4.3.1. De-hyping mechanisms

Our data analysis revealed important de-hyping mechanisms through which technologists aspired to create a level of familiarity with digital twins among internal and external users. Technologists stressed that the "demystification" of the "black box" digital twin technologies required removing the hype and buzzword connotations from the technology. To navigate digital skepticism, technologists focused on educating the organization on what digital twin is and remarked that much like end users, technologists had to educate themselves. Another prominent topic of the de-hyping discussion was a debate about the need to create and distribute a shared definition of digital twins. While some participants claimed that OGSP should stop trying to develop one definition, the bulk of technologists and managers underlined the need to orchestrate various definitions of digital twins to avoid "the mess" within the organization. OGSP, hence, scoped the following definition of digital twins: "*[A] digital twin is a virtual representation of a physical asset or system that securely holds all relevant static and dynamic information from Concept to Decommissioning, enabling high-value collaborative services*" (internal documents). Another prominent de-hyping practice was partnering with DNV, a classification society, which was seen by OGSP's digital leaders as a "supplier of trust" giving a level of confidence to clients. OGSP-DNV partnership aimed to create the standards for digital twins and establish the trustworthiness of digital twins-generated data and models.

4.3.2. What's-in-it-for-me (WIIFM) mechanisms

While participants were dubious about setting up a shared definition, the majority stressed the need to show the value of digital twins to different users. Rethinking the means of communication and user engagement were critical WIIFM trust-building mechanisms. First, technologists and managers pointed out that user familiarity with digital twins should be approached through nondisruptive discourse because the term "disruptive" is not viewed as positive in the oil and gas industry, where reliability and safety are key values. Digital leaders and digital twin team members recited multiple channels for communicating the value of digital twins to internal and external audiences. They preferred to communicate the value of digital twins via websites, social media, general media, targeted advertisements, visual presentations, and storytelling. OGSP launched a series of short "TechTalk" videos distributed through the website and social media (e.g., LinkedIn, Facebook, YouTube), in which experts discussed digital twins and other digital technologies. However, web-based communication was asserted

to be beneficial only for high-level concept familiarization and trust, while communication targeting specific customers still had to be done via dialogue: "*It's the dialogue that creates trust. Tell the story through real people, not figures*" (OGSP T.59).

4.3.3. Reality-check mechanisms

As mentioned above, OGSP's digital twin development "philosophy" was based on tangible use cases and cultivated engagement of internal and external end users. This was done to avoid developing "technology of technology," de-risk development, and create user-friendly designs. This approach sought to align and balance different expectations of so-called "personas" (stakeholders, groups of individuals) and combat skepticism toward digital twins. Several OGSP's technologists remarked that, based on their collaboration with a consultancy specialized in high-tech anthropology, expectations of digital twins varied across primary (engineers), secondary (middle management), and tertiary (sales and strategy folk) personas rather than between supplier and customer organizations. However, several OGSP's and OGO's interviewees, including top digital leaders, contested this assertion and argued that internal and external needs for digital twins were, per definition, different.

4.3.4. Trust influencers mechanisms

As indicated above, DNV and (non-)digital communication platforms were nonhuman trust influencers that built trust in digital twins at the organizational level. An experienced digital team member, however, noticed that DNV could build trust in digital twins at top management level rather than among engineers or offshore personnel who "*[did not] necessarily care about what DNV says*" (OGSP T.54). Therefore, in the local context, digital leaders, digital twin team members, and local actors "burning for change" were seen as major trust influencers whose main role was to prepare internal and external specialists who are going to use digital twins.

5. Discussion

Although several studies have examined hyped technologies [25–27, 90], the role of the hyped status in the implementation of and trust in hyped technologies such as digital twins is far from consensual [39,40]. Fig. 2 synopsizes our main findings about the application of hyped technologies as a multilevel process. This model illustrates the critical role of hype and trust building in the diffusion of technologies.

As argued below, this model shows the two main contributions of this study: (1) how the hyped status of technologies materializes in multilevel perception segmentation in the organization(s), and (2) how local interpreting actors maneuver this segmentation by building trust in hyped technologies.

5.1. Segmented perception of hyped technologies

Our intra-organizational study and the outlined model illustrate that hype engenders different intertwined pressures to adopt digital twins that differently unfold at distinct organizational levels. In particular, our results suggest that top management is primarily subject to mimetic pressures and coercive pressures from customers [59], whereby their motives (segmented perception) to adopt are optimistically presented as economically rational. Once the adoption decision is made and the responsibility to apply and interpret hyped technology descends to the lower level, the broad interpretive space of hyped technologies materializes in misguided pessimistic perceptions of hyped technologies (perception segmentation) among (groups of) actors lower in the hierarchy. These pessimistic perceptions of hyped technology at the local level occur owing to better familiarity with a technology's pros and cons compared with top management. Normative pressures may thus counteract the implementation of the technology rather than foster it as realism is informed by professional knowledge.

In contrast to extant studies reporting high initial trust in technologies [91], the model based on our findings thus suggests that the hype status of the digital twin technology, with "catchy" labeling and broad interpretive space, is a source of perception divergence and tensions. When a hype travels with the organizations, individuals use the interpretive space [64] to construct their own interpretations of how the technology must be understood and may or may not fit their local context(s). This gives rise to *perception segmentation*: what a technology entails means different and often contradictory things to different (groups of) actors. Our results suggest that perception segmentation is a multilevel phenomenon that unfolds both across organizational borders (i.e., customer versus supplier) and within organizational boundaries. In particular, the professional background is an essential differentiating factor predetermining the level of familiarity with [73] and expectations from a hyped technology. This perception segmentation along and within functional lines complicates the diffusion of hyped technologies within the organizational population as a whole. Therefore, in contrast to Wang's [5] claim that "chasing the hottest" IT leverages internal and external legitimation, our study proposes that paradoxically, although adopting digital twins may increase an organization's external legitimacy, beliefs in the technology's potential, and thus its internal legitimacy may decrease.

5.2. Building trust in hyped technologies

The outlined model also illustrates our second contribution related to building trust in hyped technologies. In accordance with recent studies on trust in advanced technologies [39,40], our findings empirically demonstrate that trust building is an essential iterative process in applying hyped technology because a hype discourse enlarges "the trust

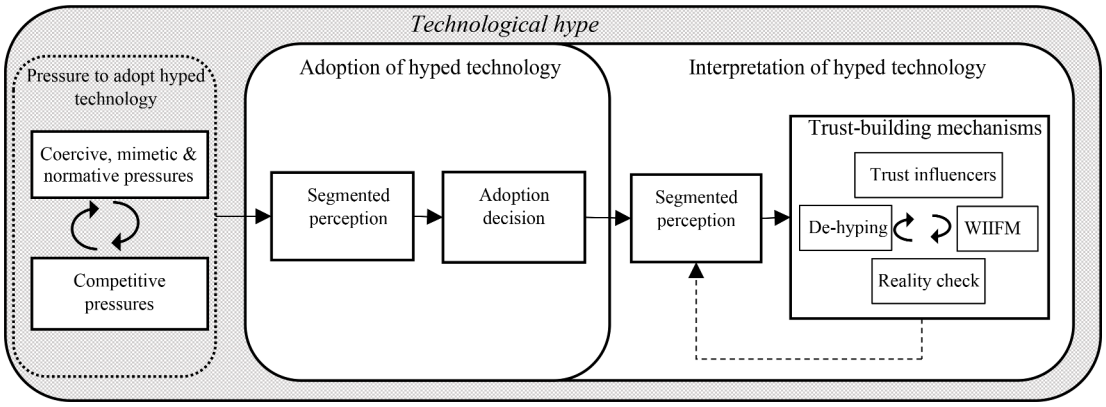

Fig. 2. . Building trust in a hyped technology.

leap" [75]. In line with calls to pragmatically approach hyped technology [34,42], this work illustrates how hype interpreters may recurrently navigate segmented perception through trust-building mechanisms. *Hype interpreters* are either middle-level managers or technical staff who need to locally assimilate hyped technologies, and thereby aspire to overcome skepticism and accelerate the acceptance of these technologies among distinct (groups of) individuals within and beyond organizational boundaries. Our study suggests that trust building in the hyped digital twin technology unfolds at several levels within the organization, where trust is built by filling in interpretive spaces which facilitates multilevel conceptual familiarity about technology reliability, functionality, and helpfulness [74].

5.3. Theoretical implications

Our study contributes to literature in multiple ways. First, this study adds value to technological hype diffusion research dominated by the rationalistic paradigm, such as the diffusion of innovation theory [92]. Our study shows that adopting hyped technologies is a cultural phenomenon prompted by competitive as well as institutional pressures [93]. This finding has important implications for how managers and key decision-makers' approach novel technologies, particularly ones similar to digital twins that achieve a hype status and are touted as game-changers. In line with Kraatz's [94] pragmatic view on neo-institutionalism, this study shows the value of applying the literature on management ideas as a useful tool for comprehending social reality (e.g., technology adoption).

Second, the impact of various pressures on top managers' beliefs is well-explored [29,61]. However, research explaining how such pressures and the hyped status of technologies influence beliefs across organizational levels is limited [41,55,69]. In contrast to the traditional conceptualization of organizations as monolithic entities with homogenous perceptions [95], this study contributes to non-monolithic thinking [96] about hyped technology adopters by highlighting the idea of segmented perception reflecting organizational heterogeneity. Whereas at face value organizations adopting the same technology appear to becoming similar and that hype leads to homogenization, even within a single organization it is being applied in various ways due to perception segmentation amid organizational stakeholders. This denotes that the deployment of hyped technologies such as digital twins should be approached as a process at several interacting levels, which must jointly achieve consensus and develop trust among them and in the hyped technology.

Third, although trust has been established as a concept to explain technology acceptance at the end-user level, research has seldom considered the role of trust in applying hyped ideas and technologies [54,78]. For instance, the *Handbook on Management Ideas* [33] does not list "trust" in its subject index. We contribute toward addressing this hiatus by providing new insights into the perilous impact of the hype status on (dis-)trustful perceptions of technology within the organization. This study particularly contributes to the pragmatic view on management ideas and trust by showing that in large-scale technology adoption projects such as digital twins, which encompass stakeholders from different backgrounds, understanding how trust is developed among these stakeholders and toward the technology is critical for assimilation and value generation. In congruence with Alvesson and Blom's [97] claim that the generation of new ideas around "hembig" (hegemonic, ambiguous, and big) academic concepts hinges on integrating different literature, this study indicates the need for the better integration of (pragmatic) trust theories in the literature on management ideas.

Finally, given the relative lack of pragmatic research on how trust is built [40,42,91], we provide a framework of trust-building mechanisms that navigate perception segmentation by constructing (groups of) individuals' confident, optimistic perceptions that a hyped technology, such as digital twins, has beneficial attributes [35]. (1) *De-hyping.* Interpreters increase familiarity with a hyped technology by taking a critical distance from the ambiguous hyped discourse when crafting the educational narrative for domain experts, managers, and technologists. (2) *What's-in-it-for-me.* Interpreters construct more confident perceptions of hyped technologies by providing experiential evidence [35] and distinctly showing its values, benefits, and disadvantages considering actors' technological frames. (3) *Reality check.* Considering the vast interpretive space of hyped technologies, interpreters identify, align, and balance the expectations and needs of managers, end users, and customers with technological functionality, largely based on user engagement. (4) *Trust influencers.* Trust influencers include human actors (e.g., managers, development team members, and super-users) and nonhuman actors (e.g., classification societies, social media, advertisements, and websites) that facilitate change management through promoting digital mindsets and familiarization with and acceptance of technology. This framework contributes to the literature on management ideas and technology adoption by highlighting the importance of downplaying the fashionable nature of hype in the local context. Notably, this framework translates pragmatist ideas [42] into the context of implementing hyped technologies based on the notion that such technologies are believed to be working and delivering value for the industry and (groups of) individuals.

5.4. Practical implications

Our findings have several important practical implications for hyped technology adoption in general and digital twin adoption in the oil and gas industry. Although our findings show that the hype status of digital twins causes perception segmentation, our ambition is not to suggest avoiding hyped technologies but rather to provide insights into the pros and cons of following such technologies. Practitioners can interpret our findings at the different organizational levels in order to preemptively recognize potential obstacles that may hinder deployment. These can then be used in a governance framework that can dictate how to deploy hyped technology, taking into account the critical aspects of the human factor and trust building that are required both among different groups of stakeholders and toward the technology. In addition, some key challenges can be easily overcome by educating different stakeholders about more practical aspects of the technology by shifting it away from the hype sphere to a more pragmatic context.

Acknowledging the impossibility (and unnecessity) of removing the hype discourse in the business world, practitioners should recognize the importance of maneuvering between multiple incongruent perceptions of a technological hype and building trust in it. This is of particular importance in the early diffusion stage, where the significance of the hype is more prominent than its actual practical relevance to the focal organization. The suggested trust-building framework may assist local stakeholders in filling in wide interpretive spaces of hyped technologies, thereby detouring them from faddish trajectories [41] and accelerating their adoption and acceptance. In particular, the findings suggest that implementers should first and foremost build trust in hyped technologies. Prior tense relationships, distrust, or different vocabularies used by various stakeholders in the organization may inhibit the formation of trust in a hyped technology such as digital twins. Thus, it is important that organizations and the relevant managers perform a thorough assessment of the socio-technical environment before rushing into deploying emerging technological trends.

A caveat to the above is that these suggestions are rational recommendations to manage partly nonrational processes. If hypes are followed blindly, recommendations for sharper vision may seem useless. However, when top managers realize that certain technology is currently a hype and is thus likely to meet internal skepticism, they can take this into account and use the technology's interpretive space to create room for experimentation, encouraging their subordinates to develop local applications and thereby trust in the technology, despite how hyped it is.

5.5. Limitations and future research

This study reports on a single case study of adopting digital twins in the oil and gas industry in Norway. We can speculate that the more tangible nature of digital twin-based applications compared to a more abstract idea of digital transformation may facilitate trust in and diffusion of digital twins in the long run. Future longitudinal studies thus could adjust the proposed model and expand on our findings on the duality of the hype status in various contexts. In addition, we examined the diffusion of digital twins in the hype growth phase. It would be interesting to examine how the model and trust-building mechanisms presented here might change as we move into the hype upswing and downswing phases.

Our study shows that despite the prior collaborative history, the customer was overly cautious in adopting digital twins. This hints that the shadow of the past collaboration and organizational trust have a limited impact on individual perceptions of hyped technologies. Further comparative studies may examine whether the shadow of the past impacts individuals' dispositions to trust hyped technologies and whether repetitive experiences with ambiguous hyped technology have a cumulative effect on individuals' trustfulness and technologies' trustworthiness. If so, how can interpreters prevent and balance this cumulative distrustfulness of hyped technologies? Eventually, future studies might explain how implementers decide on what works and what does not. We know it is close to impossible to attribute with reasonable certainty effects to a particular organizational intervention (and thus build "evidence-based management"), yet the entire pragmatic approach, as well as trust building, relies on building beliefs that something works.

6. Conclusion

Drawing on the literature on management ideas and trust, this study examined the adoption and implementation of a technological hype in the oil and gas industry, namely, that of digital twins. Overall, this study suggests that the hype status of technology is an essential theme for investigations. The research results reveal that hyped technologies are adopted at the high organizational level due to coercion and mimicry and then coercively descend to the local context. The findings further demonstrate a dual impact of the hype status on technology deployment. On the one hand, hype ensures the diffusion of such technologies due to optimism about resolving fundamental organizational problems and leveraging external legitimacy. On the other hand, facets of technological hype such as interpretive viability and catchy labels become sources of substantial skepticism that jeopardizes internal legitimacy and trust in technologies. Hence, this hype duality engenders perception segmentation hampering the deployment of hyped technologies such as digital twins. To maneuver between the optimism–skepticism perception nexus, hype implementers apply trust-building mechanisms that build familiarity with hyped technologies through filling in interpretive spaces and downplaying the hype. Based on the research results, we pragmatically propose a framework to establish trust in hyped technologies.

CRediT authorship contribution statement

Nataliia Korotkova: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft, Writing – review & editing. **Jos Benders:** Supervision, Conceptualization, Writing – original draft, Writing – review & editing. **Patrick Mikalef:** Conceptualization, Writing – review & editing. **David Cameron:** Writing – review & editing.

Declaration of Competing Interest

The authors declare no conflict of interest.

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