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Title: Reflecting on the launch of a digital transformation project in a construction company – challenges around the adoption of digital tools and technologies

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The construction industry is described by European Construction Equipment (CECE) as “one of the world’s least digitized sectors” (ICE, 2019). This working paper offers an overview of year 1 of a long term digital transformation strategy of a small construction company (with global reach) in Scotland. The UK construction industry represents a significant part of the UK economy, with 343,000 construction businesses supporting 2.4million jobs in 2018 – 7% of the UK jobs total (Rhodes, 2019). Despite this, the 2018 value of the construction industry was down on 2017 figures, the first fall since 2013 (Rhodes, 2019). In these circumstances, the UK construction industry remains in a precarious position. This is particularly challenging for small and medium enterprises (SMEs) in the construction sector. The ability of the construction industry to embrace change and innovation has been a point of some contention over recent decades (Betts and Ofori, 1992; Gale and Fellows, 1990; Lansley, 1987). This paper will contribute to answering the question what are the challenges around the adoption of digital tools and technologies in an industry with traditionally limited digital marketing practices, and more specifically through the effect of implementing digital transformation strategies and activities involved at the very early stages of a 3 year long Digital Transformation project. These early stages of the project focus predominantly on the transfer to cloud computing to ABC Group Ltd, along with the introduction of digital marketing practices, namely content generation, social media marketing and pay per click advertising (PPC), as well as foundational activities such as introduction of Lean principles to the company, restructuring of the organisation and setting out ABC Group Ltd’ vision and mission statements.

With rise of globalisation and the freeing of markets in the 1980s, the construction industry saw pressure from the ‘dash for work’ (Pettigrew, 1998) on the part of the largest construction companies in the industry, as the traditionally domestic construction industries of Western Europe and North America attempted to compete on a global stage in the wake of foreign companies being invited to bid, tender and contract on home ground (Pettigrew, 1998). More locally, the 1980s saw domestic housebuilders and commercial construction sectors rocked by a loss of consumer confidence, arguably causing a crash in all areas of the construction industry (Pettigrew, 1991). It was in the wake of this crash, coupled with the increased competitiveness of foreign construction companies that initially drove the need for construction companies to better innovate on several key factors, namely marketing, developing sustainable partnerships, and adopting Lean business practices.

As marketing practices have developed into digital marketing, the construction industry has remained slow to innovate, particularly in the construction industry's disconnect between accepting advances "on the field" and eschewing digital advances in back end process and marketing functions (Royle and Laing, 2014). Undertaking partnership on the basis of functional risk (Crespin-Mazet & Ghauri, 2007) rather than on the basis of sustainable Lean practices has been the norm, although relationship history between actors was also found to be a marker of successful industry partnership (Crespin et al, 2015).

There are clear issues in adopting certain digital marketing strategies in the construction industry, such as the limited adoption of social media as a customer relationship management tool due to a lack of perceived untrustworthiness, lack of control and the perceived risk of defamation. Construction companies have also lagged behind in applying SEO strategies to their web presence, along with using growth tactics such as PPC or technologies such as mobile apps (Liu et al., 2016).

More recently, the construction industry has begun to incorporate other digital technologies into its practices, namely through Building Information Modelling (BIM) in the project planning and delivery stages (Ibem & Laryea, 2015). While BIM has traditionally been seen as a tool for the visualisation and development of building plans and models, Vijayeta (2019) make the case that the data hewn from BIM systems actually represents a solid contributor to construction digital marketing efforts and proposes that BIM can be incorporated into a framework of digital marketing success styled as DMBIM (Vijayeta, 2019). It has therefore been submitted by Aghimien et al., (2018) that if the construction industry is to enjoy greater efficiency and accuracy in the delivery of its services, "digitalisation among construction participants must change from being just an 'idea' to becoming a 'norm'". Indeed, the introduction of BIM into construction projects, in requiring extensive training and redevelopment of traditional ways of working (Crespin et al, 2015), can be said to stimulate partnership development and innovative ways of working.

Industrial Revolution 4.0 is changing the way businesses interact with the market online and its corresponding digital communities as well as re-examining current business models and developing new models. Senior Management and organisation decision makers need to rethink process and strategy in response to the technological acceleration that is unfolding globally (Berghaus, 2016). Industrial Revolution 4.0 can be broadly categorised as a visionary but increasingly realistic concept which includes an umbrella of tools and tactics including the Internet of Things, Industrial Internet, Smart Manufacturing and Cloud based Manufacturing all of which focus on Lean principles of continuous improvement, adding value and reducing/avoiding waste (Vaidya et al., 2018). Digitalisation, on the other hand, is broadly defined as the application of digital technologies and infrastructures in business, economy and society (Autio, 2017) and arguably takes a less "big-picture" approach than Industrial Revolution 4.0.

The effects of Digitalisation have been said to increase the number of touch points among interacting actors, allowing for a greater fluidity of information while dematerialising contents thus requiring improved coordination and communication in industry (Corsaro, 2016).

These "touch points" can be seen as boundary objects (Corsaro, 2016) (Fremont et al., 2019), whereby in analysing said boundary objects insights can be gained into how communication and collaboration is affected in an organisation. The nature of a boundary object is to have different meanings in different social worlds but retaining a common and recognisable structure whereby they can act as a means of translation across these multiple worlds (Star and Griesemer, 1989). In this context, the process of digitalisation or "digital transformation" of an organisation can be seen as a collections of boundary objects, where boundary brokers (digital innovation champions), facilitate knowledge of digital innovations and BIM to support digital transformation in firms (Papadonikolaki and Azzouz, 2018).

This ongoing process of digitalisation can then be seen as a process to enable evaluation of the efficacy and functionality of an actor's supply chain, thus disrupting the distribution network, ultimately optimising the value to all involved parties (Ojala et al., 2016).

The transformative effects of digitalisation are felt fully by marketers and the wider organisation, with the ever-accelerating process creating more channels for customer and business interaction, as well as opening up new avenues for data utilising products and services (Ahmad and Bachene, 2017). Equally, "transformation" in a sales context has been seen as composing of four main elements: people, technology, integration in space and acceleration in time (Corsaro, 2019). The digitalisation of the communication process has allowed for the reduction in costs of measuring communications data, with costs becoming lower whilst increasing the requisite specialisms from marketing communications professionals (Corniani, 2006). Digital marketing automation ranks highly in surveys of successfully completed digital transformation projects (Kirchmer et al., 2016), while still presenting challenges in budget, digital illiteracy and organisational buy in.

It can be argued that the successful management of change is crucial to any organisation in order to survive and succeed in the present highly competitive and continuously evolving business environment. However, theories and approaches to change management currently available to academics and practitioners are often contradictory, mostly lacking empirical evidence and supported by unchallenged hypotheses concerning the nature of contemporary organisational change management

Positioning organisations for digital readiness is a challenging task to both large and small to medium enterprises (SMEs), with the outcome often relative to the engagement and collective understanding of the use and benefits of digital technologies. Quinton et al. (2018) argue organisations that are heavily invested and directed by a combination of market, learning and entrepreneurial orientations are amongst those that are usually well developed to adopt digital technologies. This is because their ability to change and adapt to new attitudes, behaviours and promote concepts of proactive innovation and openness to new ideas help them engage actively with digital acceleration. Their predisposition towards digital orientation depends on the factors that shape their rate of technological adoptions.

Although Digital Transformation (hereafter referred to as DT) can be defined as the use of new digital technologies that enable major business improvements and influences all aspects of customers life (Reis et al., 2018, 418), currently there is disagreement amongst academics and practitioners regarding the precise definition of DT. Liu et al (2011) use the definition "the integration of digital technologies into business processes", expanded by Lucas et al (2013) as "fundamentally altering traditional ways of doing business by redefining business capabilities, processes and relationships". More recently, Hess et al (2016) described DT as being "concerned with the changes digital technologies can bring about in a company's business model, which result in changed products or organizational structures or in the automation of processes"

Morakanyane, Grace and O'Reilly (2017) provides an insight in the variability of interpretation of Digital Transformation, describing their review of the DT literature as having "indications of an immature literature landscape coupled with a limited understanding of the phenomenon". Morakanyane et al (2017)'s systematic literature review of digital transformation compartmentalises related publications asking the question "what is digital transformation" into strategy, process, business models and a paradigm shift. In the same paper, characteristics of DT are categorised into themes around radical, disruptive, evolutionary and complex. Similarly, drivers of DT are led by digital technologies and capabilities, business models, strategies and value chains, with the impacts sorted by improvements in value, operation changes, competitive advantages, relationship building and improved customer experience. Arising from this systematic literature review in Morakanyane et al's (2017) own proposed definition of DT as "an evolutionary process that leverages digital capabilities and technologies to enable business models, operational processes and customer experiences to create value" (2017, 437).

Reddy and Reinartz (2017) describes DT as producing massive data sets, and provides tangible and intangible values, greater transparency for customers, reduced costs, efficient and effective value chains and reduction of boundaries, and the changing digitisation of the workplace (for example flexibility of the workplace). "Often, it is the whole business model that needs to be new or invented to create real value", "fix your mindset and then your actions" "entire industries will be threatened if they do not react quickly, while others are emerging instantly as if out of nowhere". However, DT can, conversely, be said to be enacted through the development and implementation of one of more digital boundary objects (Fremont et al., 2019), suggesting that the DT of the future can be implemented on a rolling schedule which protects organisational equilibrium.

This paper utilises a case study approach where the authors will examine the employee reaction to the initial application of digital transformation strategies to this otherwise traditional business.

ABC Group Ltd is a family-owned construction company based in the West Coast of Scotland and primarily serving the local Ministry of Defence bases. The company had grown organically over the preceding 25 years, and found that many of its internal systems were not fit for purpose and the company experienced a period of rapid growth. ABC Group Ltd entered into a Knowledge Transfer Partnership with the University of the West of Scotland in order to undertake a three year digital transformation project to ready ABC Group Ltd for continued business growth and a changing business landscape.

The methodology consists of a qualitative study utilising semi-structured interviews of ten members of staff at ABC Group Ltd. Interviewees consist of all administrative and managerial personnel at ABC Group Ltd with the exception of two members of staff (due to scheduling issues). These interviews demonstrate the baseline position of the company staff at the commencement of a long term digital transformation project.

Furthermore, we draw upon the authors' observations, a review of organisational documentation (policies and procedures, business processes, marketing materials) and data analytics to demonstrate the effect of creating and implementing a digital transformation strategy on business growth and development, digital maturity and employee satisfaction, with ABC Group Ltd, a family-owned construction company based in the West Coast of Scotland and predominantly working within Ministry of Defence premises. Our study illuminates the challenges of working in a family owned SME in an industry where there is somewhat reluctance to adopt digital tools and technologies.

Research was carried out in the framework of Grounded Theory (Glaser & Strauss, 2017), due to the author's utilisation of a range of research methods (El Hussein et al., 2014) grounded in the context of ABC Group Ltd as a family-run construction SME.

Thematic analysis (Braun and Clarke, 2013) was carried out on the interviews and findings organised as key themes, displayed in Table 1 below.

Staff were interviewed at the beginning of the DT project. These interviews indicated a number of challenges within the organisation around a lack of consistency in approaches to digitalisation, issues around hardware, access to wifi and internet capabilities within the organisation's head office, and a lack of clarity around the key roles and responsibilities of different team members. These themes were loosely grouped around the framework for digital orientation as set down by Quinton et al (2018). This framework notes that there are specific antecedents required for the necessary digital preparedness and reactivity of SMEs and acts as a development of the concept of strategic positioning in the digital environment set forth by Sandulli, Baker and Lopez-Sanchez (2013).

<p>Theme 1 – Organisational Issues</p> <p><i>Organisational Structure</i></p>	<p>Respondents generally reported that the company lacked a coherent structure with well developed and specific job roles which functioned to serve all aspects of the business.</p> <p>“it’s the company structure...there is no understanding of who does what... there is no comprehensive it system along... with issues of storing things on Dropbox. I’ve asked [management] where the server is and I’ve been ignored”</p>
<p><i>Internal Communications</i></p>	<p>All respondents noted that internal communications were disorganised and fractious, with chains of command often being ignored in order to take issues directly to the Managing Director, causing overload and a general feeling of “firefighting” for the Managing Director. The Managing Director relayed that this had the effect of taking him away from revenue generating works, particularly in attending site visits of new works and quoting for new works. It was generally agreed by all participants that this lack of robust communications strategy has a barrier to business growth and organisational development.</p> <p>As well as the lack of internal communications strategy in terms of direct reports, it was also reflected by the participants that there was a lack of top down or two way communication, where there was a general feeling among participants (particularly those who were family members) that they did not have adequate information about the performance of the company, or of any company news.</p> <p>“we have a real problem with communication here...”</p>
<p><i>Business Development</i></p>	<p>It was generally noted by the participants that business development and marketing functions of the company were carried out very much on an ad hoc basis and utilising mainly traditional methods. Most participants pointed to one or two particular individuals who were largely focused on the business development aspect of things; however this occurred primarily in the context of networking while already on site which compounded the ongoing issue of exposing the company to the greater risk of concentrating too much work with one or two clients.</p> <p>Where marketing activities had been carried out before, participants noted that they had been carried out in a traditional manner, namely through the creation of print materials, attending networking events and exhibiting at national security and defence expos. While the participants noted that there was a relative amount of success in generating leads from these avenues, following these leads up had been somewhat neglected and that this had had an impact on the past growth of the company into new markets.</p>
<p><i>Organisational goals and values</i></p>	<p>The respondents reported that the company had not undertaken any research and exploration into ascertaining organisational goals and values, which they felt had not hampered the success of the company to this point but left the company lacking vision and a focus towards the future.</p> <p>The Managing Director discussed his goals for the company, but admitted that he had not formally verbalised this to the rest of the staff, or even the management.</p> <p>Where there was a distinct lack of organisational aspiration in the participant responses, the respondents themselves vocalised</p>

	<p>aspirations for themselves within the company, whether that be in achieving directorship status in a larger company structure, attaining personal training and development goals, or being able to retire early.</p>
<p><i>Organisational culture leading to a fear of change</i></p>	<p>The respondents reported that there was a close knit family dynamic in the business, and that the Managing Director in particular, was accommodating to a fault and often at the expense of his own workload. More negatively, it was noted that there was a lack of desire to develop and work under their own initiative, with almost all respondents naming other members of staff who didn't "pull their weight" or act as a team player.</p> <p>"I know other team members are also frustrated with some of the systems that are in place"</p> <p>"The UK is generally quite slow on technology adoption"</p>
<p><i>Risk resilience</i></p>	<p>All respondents spoke about their concerns with the company turnover coming almost entirely from two major clients and the risk that this posed to the company. There was a general feeling of openness towards expanding into new markets in order to make the company risk resilient as well as support the growth of the company.</p>
<p><i>Theme 2 – Current Skillsets</i> <i>Current use of digital marketing</i></p>	<p>The respondents noted that the company's web presence was poor and that application of technologies such as PPC, social media marketing and utilising technologies such as 360 video, data driven marketing and content marketing were generally unknown concepts in the company. The respondents noted that this was largely due to the classified nature of where the company works were predominantly carried, i.e. on nuclear military facilities, and therefore made it difficult to create content based around the work that the company carried out on a regular basis.</p> <p>There was also a general feeling throughout the participant responses that the company had relied on word of mouth marketing to develop the business and that this continued with works often being awarded on a seemingly ad hoc basis while operatives were already engaged in other works on the military base.</p>
<p><i>Limited IT Skills</i></p>	<p>It was noted by the respondents that the Managing Director has relatively poor IT skills, and this was supported by the Managing Director himself. However, while the respondents generally had a negative point of view as to whether the Managing Director would be in the position to acquire the skills required to fully embrace a digital transformation project, the Managing Director himself reported very positive and responsive feelings towards becoming more "tech savvy", and noted the benefit that this would have not only to company growth and development, but also to his own efficiency and abilities to be more location independent</p>
<p><i>Theme 3 – Technology and infrastructure</i> <i>Access to Technology</i></p>	<p>Most respondents reflected on how the physical access to current technology was lacking throughout the company, with access to basic IT infrastructure being poor and unreliable. While the company is furnished with wireless printers, laptops and other IT apparatus, respondents confirmed that a great deal of working time throughout the day was taken up by dealing with unreliable technology or poor performing technology that does not support the latest versions of apps or other applications utilised by the company.</p>

	<p>“it's the technology... it's the internet, it's everything.”</p> <p>“I'm trying to get the laptop fired up in the work pack printed off and the only way I can turn everything off... it might only be a printer that's a problem but its that that stops me from doing my job”</p>
<i>Movement to cloud</i>	<p>The first major technological transition slated in the digital transformation project was for the company to move to a cloud-based computing system, namely G-Suite, in order to create a collaborative and responsive working platform. During the course of the interviews, many participants were aware to different degrees as to the implications of movement to a cloud-based system. However, there was a general feeling of positivity in the implementation of cloud-based computing systems, although all respondents advised that they would require extensive and ongoing training on the use of the system.</p>
<i>Connectivity</i>	<p>Responses from participants indicated that connectivity was a prominent issue throughout the company, affecting numerous operational and communicative functions while creating ongoing productivity issues and having a negative effect on staff morale.</p> <p>The poor standard of internet connectivity on the rural site was mentioned by all respondents as a major barrier to moving towards a more digitally orientated business strategy.</p>

Contribution to knowledge and practice

The findings of these interviews, triangulated with observations of the organisation by D and other members of the research team, led to the following early reflections regarding the operations of ABC Group Ltd:

- Some staff members are not being utilised to their full potential;
- Conversely, some staff members do not carry out the responsibilities of their job titles, particularly in the supervision aspect;
- Overly bureaucratic and confusing systems of administration are inefficient and lead to mistakes being made;
- Planned jobs are often changed at last minute to accommodate other works;
- Some members of staff act as “gatekeepers” to information which creates inefficiencies and bottlenecks in the client journey.

While these observations are based on ABC Group Ltd, they reflect common complaints found in traditionally non-digital SMEs as they move towards digitalisation and the adoption of Lean strategy and operations. As an industry particularly lagging in application of Lean and development of digital transformation projects, these reflections can be seen to be applicable to many smaller companies within the construction industry.

This working paper will contribute to a growing body of literature around digital transformation practices, with novel insights from a longitudinal case study around the complex construction and security industries.

In this case the research team are both leading and driving the digital transformation strategy in a challenging organisation and industry, with author D continuing to operate as ABC Group Ltd's digital transformation manager over the lifetime of the digital transformation project (3 years in total and 2 years remaining), as well as taking on the role of participant/observers. The findings of this research project can inform digital transformation strategies for a similar complex industry.

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