Digital Bricolage: Creating a Digital Transformation from Nothing

Short Paper

Stan Karanasios
University of Queensland
Australia
s.karanasios@uq.edu.au

PK Senyo
University of Southampton
United Kingdom
p.k.senyo@soton.ac.uk

John Effah
University of Ghana
Ghana
jeffah@ug.edu.gh

Aljona Zorina
IESEG School of Management
France
a.zorina@ieseg.fr

Abstract

Current research offers limited knowledge on digital transformation of micro-enterprises, and even less so, micro-enterprises suffering systemic resource constraints. Addressing this gap, we examine how micro-enterprises use digital technologies to change and improve their businesses in the context of multiple resource constraints. Based on a large-scale qualitative study of micro-enterprises in Ghana and data from government and technology firms, we examine the question: how do micro-enterprises undergo a process of digital transformation by engaging in bricolage with digital technology? The preliminary findings show that digital transformation of micro-enterprises in resource-constrained environments emerges across three paths: (1) resource mobilization through the constitution of digital resources over time, (2) resource combination through digital / non-digital configurations, and (3) resource deployment through a specific way of using these resources. Based on the findings, we develop an initial process model of digital bricolage that advances understanding of digital transformation of micro-enterprises.

Keywords: Digital bricolage, digital transformation, micro-enterprises, process model

Introduction

Current research on digital transformation (DT) emphasizes organizations and sectors at the forefront of digital innovation, such as the finance and technology sectors and large traditional firms. Insights from these studies have limited relevance to understanding DT of micro-enterprises, and even less so enterprises suffering systemic resource constraints. Addressing this gap, we examine how micro-enterprises use digital technologies to change and improve their businesses in the context of multiple resource constraints. Examples of such enterprises include market vendors, small-holder farmers, petty-retailers and auto mechanics. These enterprises historically operate from physical locations (e.g., streets, open markets, lorry terminals, improvised shops and workspaces) and conduct cash-based transactions face-to-face within limited geographical areas. The importance of such enterprises for employment and supporting livelihoods is well recognized (World Bank. 2021). As typically with a one-person venture, economic benefits for the business translate into direct benefits for the owner and thus provide a source of income and a way out of poverty (Sutter et al. 2019).

With greater diffusion of digital technology such as mobile phones that act as a vehicle to financial services, as well as the cloud, the growth of platforms to trade on and social media networks to engage with customers, there is opportunity for a DT of micro-enterprises. Such technologies have several taken-for-

granted advantages for micro-enterprises. They are used in everyday contexts, meaning owners are familiar with them. They are also easier to handle, take up less physical space (e.g., files or images stored in the cloud), are low cost or free (e.g., social media) and tie into societal behavioral shifts such as a move from cash to mobile payments and sharing information and connecting via social media. As such, DT of micro-enterprises can be an organic form of bottom-up development driven by agency and entrepreneurial activity.

The question of how micro-enterprises in developing countries undergo a process of DT has hitherto been undertheorized. Because of the inherent resource challenges faced by such enterprises, their informal nature and the 'invisible chains' of their environments as well as the cultural views of business (Slavova and Karanasios 2018), we turned to literature on entrepreneurial bricolage, defined as "making do by applying combinations of resources at hand to new problems and opportunities" (Baker and Nelson 2005, p. 333), since it provides insights into the dynamics of resource development and emergent activities of micro-enterprises (Baker and Nelson 2005; Duymedjian and Rüling 2010; Rüling and Duymedjian 2014). Specifically, we consider bricolage with digital technology that enables micro-enterprises to increase their efficiency and address resource constraints of their environments. We address the research question: *how do micro-enterprises undergo a process of digital transformation by engaging in bricolage with digital technology?* We undertake a large-scale qualitative study in Ghana through interviews conducted with micro-enterprises, government actors, mobile network operators as well as technology firms. We report on our preliminary findings and develop an initial process model of digital bricolage that explains micro-enterprise's DT (Baker and Nelson 2005; Ciborra 1996; Duymedjian and Rüling 2010).

Digital Transformation and Bricolage

Following Vial (2019, p. 3) we define DT as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies." Often, such changes concern implementing technology in organizational distribution and sales channels to improve customer proximity (Vial 2019) or to rapidly adapt to a fast-changing environment (Li et al. 2018; Vial 2019). At the same time, such changes emerge not from technology per se, but from changes and adaption of related organizational capabilities (Vial 2019). However, studies of DT have predominantly focused on large companies and corporations and provided limited insights on DT of micro-enterprises facing severe resource constraints.

In this regard, entrepreneurial bricolage provides an important theoretical concept explaining how organizations might create and find resources in constrained environments (Baker and Nelson 2005; Duymedjian and Rüling 2010; Zorina 2021). It draws on Baker and Nelson (2005) who built a theory of bricolage following Levi-Strauss's (1966), seminal work "The Savage Mind." The theory of bricolage has also been applied by IS scholars to understand the use of technology as important organizational and communitarian resources at hand (Ciborra 1996; Lanzara 1999; Zorina 2021). A commonality in these views is that bricolage involves constitution over time of a stock of resources; emergent way of using these resources; and, a specific kind of outcome that is subject for further recombination to meet emergent needs (Duymedjian and Rüling 2010). In the context of our study, this means a "bricoleur" (micro-enterprise owner) uses digital resources which have been collected during unplanned encounters and built up over time to constitute a stock of resources that can be deployed in future actions. From a DT perspective, this can be viewed as the technologies that micro-enterprises accumulate over time (e.g., mobile money, Instagram, cloud, mobile payments, etc.) with a way of configuring these into a dynamic business activity that creates some kind of business-related outcomes. Bricoleurs begin assembling their resources into an emergent and unpredictable arrangement which, while it is aimed at solving the problem, is not based on an ideal, preconceived solution. Bricolage proceeds through processes of tinkering and substitution, trial and experimentation by using resources from the bricoleur's stock to reach an arrangement that "works"— in other words, when, and as long as it enables them to address the situation at hand (Duymedjian and Rüling 2010). As this suggests, DT may not be intentional or a strategic imperative, rather it is a process *and* an outcome of "making-do" (Lévi-Strauss 1966) with technology as a result of emergent challenges and opportunities.

The theory of entrepreneurial bricolage suggests a need to consider the various ways that each of a firm's resources can be used. It also suggests there is a myriad of possible useful combinations, meaning that "no firm ever perceives the complete range of services available from any resource" (Penrose 1959 p. 86). This

line of thinking gives rise to three important considerations (Baker and Nelson 2005) that are relevant to digital transformation and micro-enterprises. First, each micro-enterprise is unique in its idiosyncratic relation to its resource environment (including digital resources). Second, there are substantial differences among micro-enterprise in their ability to survive or prosper given similar resource constraints i.e. different micro-enterprises will discover and create different digital combinations from similar objective resources. Third, the same digital resources may be ignored by one micro-enterprise but considered valuable to another (Baker and Nelson 2005). Together, these three characterizations of the micro-enterprise resource environment provide a basis for understanding how they might create valuable digital combinations in penurious environments.

IS scholars are also beginning to study the unplanned and unpredictable ways that DT unfolds. In their study of technology change, Hartl and Hess (2019) propose bricolage as a strategy used initially to cope with changing project requirements. Recent interest in digital resource bricolage has also been linked to how organizations responded to COVID-19 such as transitioning from offline to online work (Cui et al. 2021). In this light, a bricolage approach to DT in resource-poor environments suggests that resource-constrained managers make sense of, and make do with, resources at hand and create from a diverse range of available technologies. Thus, at the core of our theorizing is the notion that micro-enterprises engage in bricolage with digital technologies to overcome resource constrains (Baker and Nelson 2005).

Method

Research Design

The study is concerned with understanding DT of micro-enterprises within the context of resource-poor environments. In line with this, the setting of Ghana is important for our theorizing in several ways. Most notably, the resource constraints and threats to survival and growth that micro-enterprises face as well as opportunities (Aldrich 1999) demand creative thinking, improvisation and bricolage by micro-enterprises. Evidence also suggests that despite an underdeveloped ICT infrastructure, there is widespread uptake of mobile money (e.g., 17m active mobile money accounts) and other Fintech innovations (Bank of Ghana. 2020; World Bank. 2017) and social media with up to 70% of Ghanaians using WhatsApp, 83% using Facebook, 69% using YouTube, 56% using Instagram, amongst other platforms (Sasu 2021). In addition, mobile phone penetration is over 100% (Bank of Ghana. 2020), meaning the traditional stumbling blocks of affordability and access to digital technologies and infrastructures have been ameliorated to some extent.

Data Collection

Our data collection strategy is qualitative and embedded in the local context. We report on two phases of data collection from 2019 to 2022.

Phase 1: In Phase 1 of the research, our fieldwork focused predominantly on how micro-enterprises incorporate financial technologies into their day-to-day operations. This led us to understand how financial technologies become embedded in business practices in unplanned ways and revealed to us how different digital technologies were being fused together. We interviewed 15 micro-enterprises in Ghana. We also interviewed government agencies to understand development policies around financial inclusion as well as mobile network operators and technology firms (mainly those delivering financial technologies) whose technology services were being appropriated by micro-enterprises in unanticipated ways. Sampling of these organizations was predominantly through pre-existing relational and professional networks as well as formal introductions. As the fieldwork progressed in this phase, it became apparent that firms bring together different digital technologies in different ways in an unplanned fashion, e.g., they build on mobile technology, with mobile money, social media and cloud etc. Moving between the data and the literature as we analyzed this data led us to the concept of bricolage (Baker and Nelson 2005). Thus, the study moved from a study of technology use to the concept of bricolage as a characterization of the behaviors we observed.

Phase 2: In Phase 2, we reoriented our efforts to focus on digital bricolage. In this way, our sampling approach shifted to theoretical sampling. At the same time, because of the context and the need to informally know micro-enterprises and the difficulty in engaging with government agencies and large technology firms, our sampling also necessitated snowballing (Baker and Nelson 2005). In this phase we undertook 21 interviews with micro-enterprises. The interviews zoomed in on the practices of resource-

constrained micro-enterprises and their responses to their environments and how they were able to leverage and render their stock of digital resources at hand for new purposes. In addition, we went back to four enterprises in Phase 1 to ask more in-depth questions. We also interviewed government agencies, a broader spectrum of technology firms and mobile network operators (Senyo et al. 2022). The focus of these interviews was to delve deeper into how micro-enterprises used their services as well as the activities of those firms in DT initiatives in Ghana. This is important because while in the study of larger firms it is possible to pose similar questions to various respondents from the same firm, it is not the case in micro-enterprises. Thus, data collection from government and technology firms offers triangulation as well as helps to shed light on matters around government and technology activities that impact micro-enterprises. As in Phase 1, sampling of these organizations was predominantly through pre-existing relational and professional networks as well as formal introductions. All interviews were semi-structured, tailored to each participant, and conducted in English. Interviews were conducted face-to-face during the fieldwork phases (some were by virtual means due to COVID-19 requirements).

Phase	Organization type	No. of organizations	No. of interviews
Phase 1	Micro-enterprises	15	29
	Government	1	16
	Mobile network operators	2	5
	Technology firms	8	15
Phase 2	Micro-enterprises	21	19
	Government	1	5
	Mobile network operators	1	1
	Technology firms	10	16
Total		**59**	**106**

Table 1. Data Collection

Analysis Procedures

We adopted established grounded theory tenets (Corbin and Strauss 1990) for the data analysis to ensure rigor, trustworthiness, and contextually specific understanding. Specifically, we coded the data following a process of open, axial, and selective coding to address our research question and make data-to-theory connections. During open coding, we stayed very close to the data to identify the different kinds of statements and questions that emerged in a given interaction and, as a result, develop first-order concepts (Corbin and Strauss 1990). This was done until the analysis stopped yielding sufficiently distinct first-order categories. Moving back and forth between the data and theory on bricolage and DT we then built more abstract second-order themes during the axial coding. This analysis led to second order concepts such as repurposing, improvisation, lean, multi-channel and alliance. Finally, we performed selective coding (Corbin and Strauss 1990) by aggregating the second-order themes into overarching theoretical constructs. This enabled us to identify three processes of DT—*resource mobilization, resource combination,* and *resource deployment*, as theoretical aggregate dimensions. We continued the analysis by iterating between the data, findings, and theoretical lens until we reached a point of theoretical saturation. Throughout the analysis, we drew on evidence from at least two sources, such as interview data from two different participants (e.g., a micro-enterprise and technology firm, or two micro-enterprises) to ensure the validity of our findings.

Preliminary Findings

We start by providing an overview of how micro-enterprises use digital technologies. Importantly, these are free, assembled over time and arranged in different ways to form a viable business model, whilst addressing the situation and opportunities/problems at hand. Following Table 2, we outline the three processes which explain the different ways the firms used, combined and deployed these resources as well as their practices and outcomes. In our findings, we draw predominantly on the data from micro-enterprises with supplementary data collected from technology firms, mobile network operators and government agencies.

	WhatsApp, Telegram etc	Facebook, Instagram etc	Dropbox, Google Docs etc	Online/ mobile banking	Mobile money payments	Mobile money loan	Selling platform (e.g. Jumia)
Frequency	High	High	Low	Low	High	Low	Low
Use	Communication and advertising	Advertising platform	Data storage	Banking	Payments	Startup funding	Reaching markets
Overcoming constraints/ opportunities	Inexpensive way to communicate with customers	Inexpensive way to reach customers	Free data management	Online financial transactions	Accessible way to receive/ make payments	Quick loans	End-to-end solution
Table 2. Micro-enterprise digital profile							

Through our analysis and inspiration from the bricolage theoretical lens, we observe that DT of micro-enterprise occurs via three distinct, yet interdependent ways: (1) resource mobilization through the constitution of digital resources over time, (2) resource combination through digital/non-digital configurations, and (3) resource deployment through a specific way of using these resources. While these may be interpreted as sequential, our preliminary analysis shows that they sometimes occur concurrently rather than linearly. We discuss each of these in the following subsections.

Resource Mobilization (the Constitution of Digital Resources Over Time)

The micro-enterprises faced resource constraints, and for them, the first step in their DT process involved resource mobilization. By resource mobilization, we mean the process by which micro-enterprises actively pursue and obtain resources critical for digital business operations. We observed that digital resources such as digital payment and social media platforms, which were initially used for personal transactions were mobilized for business activities. We noted two forms of resource mobilization, namely repurposing and improvisation/appropriation. Under repurposing, micro-enterprises typically use resources meant for personal use for business. For instance, to make do with available resources, micro-enterprises tend to repurpose personal resources such as mobile money, WhatsApp, and Facebook accounts for business. These resources come from an internal source since they are owned by the bricoleurs and initially for personal use. A micro-enterprise owner summarized as "*for advertisement, receiving payment and for customer engagement, I use my personal mobile phone so that I don't have to buy another phone for the business*" (ME7).

We also noted another form of mobilization—improvisation/appropriation, which we define as using a resource differently from its originally intended purpose. A case in point is borrowing of micro-loan, meant for individual use as a source of startup capital. Since these resources are primarily not owned by the micro-enterprise, we designate this as an externally sourced resource. This form of resource mobilization is summarized by a micro-enterprise owner as:

"*So, I borrowed from MTN [mobile money] and they started giving me small, small, small. And that small, small I was taking it [microloan] consistently so I will be able to grow... So, it was personal money they were giving to me. Of course, they wouldn't know it's for business*" (ME5)

A mobile network operator (MNO) who offers this loan confirmed this form of resource mobilization by micro-enterprises as follows:

"*You meet them [micro-enterprises], and they will say, this your product [microloan] is helping me. I'm able to borrow up to GH¢1,000. I bought a few products. I've paid back. I'm able to borrow again*" (MNO3)

Though resources mobilization occurs during the formation stages of micro-enterprises, the practices of resources collection continues indefinitely. This is done to ensure that micro-enterprises can either take advantage of opportunities or mitigate constraints that may emerge in the future.

Resource mobilization	Definition	Sources of resource	Examples
Repurposing	Using an object differently than it's originally intended	Internal	Using a personal mobile money account for business
Improvisation/ Appropriating	Using a tool (e.g., micro loan) for a different purpose.	External	Borrowing startup capital through mobile money designed for individuals
Table 3. Resource mobilization			

Resource Combination (Digital / Non-digital Configurations)

Resource combination concerns how the micro-enterprises put together digital and non-digital resources. This is done through practices of disassembling and reassembling, permutation, substitution. As the micro-enterprises are involved in buying/selling they tend to favor the combination of complementary resources that align with the trading business model. From our findings, we find two main instances of resource combination during DT: (1) digital-digital, and (2) digital-non-digital combinations. The digital-digital combination is where two or more digital resources are leveraged to support the transformation process. For instance, we observe that during DT, micro-enterprises tend to combine two or more social platforms as their mode of advertisement since they want to make do with whatever resources at their disposal can enhance their businesses. A micro-enterprise owner noted:

"*I already had a Facebook account there, so I started using it, and then I was using my WhatsApp account too in addition. So that was what I started before I started going to Instagram and others …, you'll be there and they [customers] call you [on the phone]'or you'll be there on WhatsApp, and then even through Facebook or DM you*" (ME4)

We also noticed a combination of digital and non-digital resources in the enterprise DT processes. For instance, in spite of running a purely digital business, micro-enterprises were still open to using both electronic and cash payment channels. While cash transactions could have been completely discarded, some micro-enterprises choose to combine the use of both digital and non-digital payment channels since this ensured engagement of customers who preferred physical payment option. A business owner explained the combined digital and non-digital payment options:

"*So, I use my personal number for MoMo Pay [digital payment]. But many customers request to pay cash. Sometimes, people are skeptical about online shopping so people would like to see their item and then pay. In situations like that, we insist that the delivery guy takes the money [cash payment]*" (ME10)

Resource Combination	Definition	Examples
Digital-Digital	Levering two or more digital resources during DT	Combining two or more social media platforms (e.g., using both WhatsApp and Instagram for advertisement)
Digital and Non-Digital	Amalgamating digital and non-digital resources for DT	Using two or more physical and digital payment channels (e.g., cash and digital payment)
Table 4. Resource combination		

Resource Deployment (a Way of Using these Resources)

At this stage of DT, micro-enterprises deploy the mobilized and combined resources for business purposes. We defined resource deployment as the utilization of bricolage resources for business operation in a digitalized business environment. Building on the resources mobilized, we observe that micro-enterprises tend to adopt a combination of three resource deployment approaches for DT, namely (1) multi-channel, (2) lean and (3) alliance. While these approaches may appear exclusive, we witnessed micro-enterprises' adoption practices of trial and experimentation in combination with approaches based on their business model, offerings, and digital savviness of owners. The multi-channel deployment focus on using resources to deliver business operations using more than one online/offline medium. The multichannel resource deployment is analogous to the "brick and mortar" business model where resources are deployed to support

the operation of a physical shop in addition to an online presence. The owner of a micro-business explained the rationale for this approach:

"Some people say they don't trust you yet, so they'd rather come. Others will say, I want to try on clothes. You want to try on and see what you are getting or something." (ME11)

The lean approach focuses on using resources sparingly for efficient business operation. Under this approach, micro-enterprises operate a purely virtual business that does not hold stock. Rather, they focus resources heavily on advertising through social media so that whenever there are orders, they then place the orders from the supplier, who delivers directly to the customers. A micro-business owner explains the lean approach as follows:

"Thanks to social media, you don't actually have to keep stock, especially if you are young [business], if you're a small business…You don't need to keep stock. You can just go and take the pictures in another [suppliers'] shop and post. Somebody will order it then you can go and buy." (ME5)

On the other hand, the alliance approach focuses on deploying resources to develop strategic relationships with auxiliary services such as motorbike delivery services, financial technology (FinTech) services, and other actors. With these alliances, micro-enterprises are able to rely on their partners to perform critical business functions on their behalf while they focus on other core operations. For instance, by developing alliances with motorbike delivery firms that provide efficient logistics services at a commission. Thus, instead of always spending critical resources to get orders to customers, there is a guarantee that the motorbike delivery partners will do so efficiently. In a similar way, developing alliances with technology solution providers ensured handling the digital operations of micro-enterprises whose owners were not highly digitally savvy. A micro-enterprise owner and a Fintech owner respectively explained that:

"The business let me say it doesn't have a delivery service. So, what we do is we outsource to an agency. Normally it does the delivery at a cost. The customer actually pays for the service, for the delivery service." (ME12)

"As a way of helping SMEs put together their financials so that they can access, you know, funding from their banks, and microfinance institutions [referring to their product]." (FinTech12)

| Resource Deployment	Definition	Examples
Multi-channel	Deploying digital resources across multiple channels to support business operations	Using digital resources to operate a physical shop to complement the digital business
Lean	Deploying digital resources in a sparingly way to support business operations	Using digital resources to operate a purely digital business which doesn't hold stock or direct employees
Alliance	Deploying digital resources to form strategic relationships to support business operations	Using digital resources to form key relationships with partners (e.g., motorbike riders, FinTech firms, social commerce platforms)
Table 5. Resource deployment		

Outcomes of Digital Bricolage

Through digital bricolage, micro-enterprises were able to achieve DT outcomes such as increased customer base and sales, improved operational efficiency, flexible working arrangements and reduced overheads. For instance, with DT, the majority of micro-enterprises do not need to pay rent for a physical shop, thereby reducing their overhead. Similarly, micro-enterprises are able to reach more customers and increase their sales. Micro-enterprise owners linked their DT to business outcomes that otherwise would not be possible:

"Yes, it [DT] has really changed the face of my business because before I was even thinking that I had to get a shop but now I am able to get more sales. Like what I said earlier on, before I wasn't even selling much like the way now, I'm doing online, because I have the platforms there and it's really growing, I'm telling you. It's really helping me" (ME4)

Discussion and Conclusion

Based on our preliminary findings, we propose a process model of digital bricolage for micro-enterprises DT (see Figure 1). Our model suggests that micro-enterprises develop an assemblage of practices that enable them to repurpose, improvise and appropriate the value of limited available resources; they also develop configurations of digital and non-digital resources and employ these in multi-channel and lean ways to support their business operations. As outlined in Figure 1, DT of micro-enterprises starts with resource mobilization, which is normally during the early stages of the business or when a problem arises. Resource mobilization occurs through repurposing and/or improvisation of existing resources that are internal or external to micro-enterprises. Following resources mobilization, micro-enterprises undertake resource combination to take advantage of opportunities as well as mitigate constraints arising from problems at hand. Given micro-enterprises operate in both physical and digital spaces, they undertake resource combination through digital/non-digital configurations. Lastly, having mobilized and combined resources required for DT, micro-enterprises undertake the final step of resource deploying using three main approaches of multi-channel, lean, and alliance. Throughout the DT, micro-enterprises adopt a combination of several practices such as trial and experimentation, disassembling and reassembling, permutation, substitution, and continuous collection of potential resources.

Figure 1. Digital transformation of micro-enterprises through digital bricolage
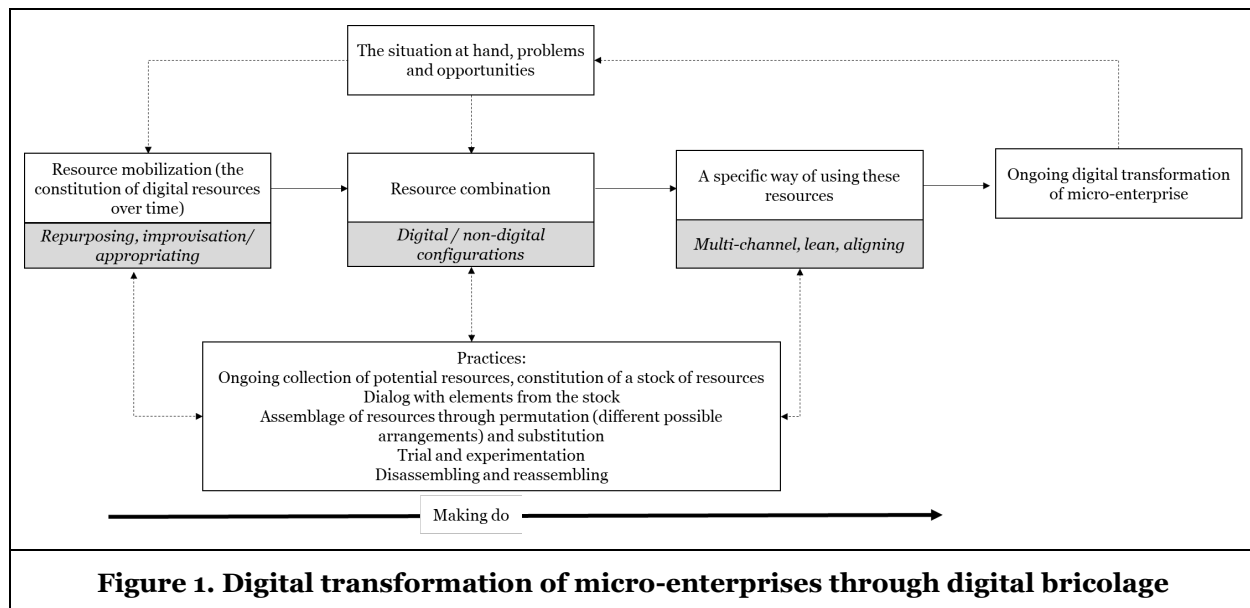
Our findings support previous studies illustrating that bricolage helps organizations to maintain their capacity to act, rather than being paralyzed, and grow in resource-scarce contexts (Baker and Nelson 2005; Duymedjian and Rüling 2010). We extend these findings to contemporary organizational DT context by focusing on the value of bricolage with digital technologies and contributing to emergent studies on digital bricolage (Cui et al. 2021; Hartl and Hess 2019). Our findings highlight key processes and practices (the bottom box in Figure 1) (Duymedjian and Rüling 2010) based on which bricolage with digital technologies enables micro-enterprises with shortage of resources to successfully transform digitally and grow. These processes specify the key phases of bricolage suggested by Baker and Nelson (2005) and extend the value of these for DT of micro-enterprises. Further, our findings also contribute to research on organizational DT (Vial 2019) by extending currently limited insights on DT of micro-enterprises facing severe resource constraints. This study offers practical implications for micro-enterprises that can undergo DT to increase their performance, pursue post pandemic revival (Karanasios 2022), and compete with larger firms. Our goal is that our research may help practitioners to translate DT into a persuasive strategy for development and move away from top-down digital technology interventions which have been argued by scholars to have had limited impact (Wade 2004).

Acknowledgements

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