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La historia del emprendimiento en retrospectiva: un enfoque exploratorio desde la arqueología industrial

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Abstract: .

Purpose: To determine under which mechanisms artifacts can be employed to build up a history embedded within an entrepreneurial project (its processes), shedding a novel, new in-depth, multidimensional analysis of entrepreneurship.

Methodological design: An approach from Industrial Archeology (IA), consisting of two stages: the artifact is deconstructed in its material and usage context, and later into an organizational context, in conjunction with historical and qualitative techniques (triangulation and hermeneutic interpretation).

Results: A conceptual proposal is made to analyze and understand the entrepreneurial processes.

Research limitations: As any conceptual proposal is purposely simplified, which can be seen as a disadvantage.

Findings: It is suggested to analyze the history of entrepreneurship from IA, as the artifact can give specific and valuable information regarding the processes under which they were conceptualized, design, produced, sold, adapt, or get obsoleted, and the impact it had on the business.

Keywords: entrepreneurship, history, Industrial Archaeology, artifact.

Resumen: .

Objetivo: determinar bajo qué mecanismos se pueden emplear los artefactos (productos / servicios) para construir la historia incrustada dentro de un proyecto emprendedor (sus procesos), arrojando un novedoso, nuevo análisis en profundidad y multidimensional del emprendimiento.

Diseño metodológico: enfoque desde la Arqueología Industrial (AI), que consta de dos etapas: el artefacto se deconstruye en su contexto material y de uso, y luego en aquel organizacional, en conjunto con técnicas históricas y cualitativas (triangulación e interpretación hermenéutica).

Resultados: se realiza una propuesta conceptual desde la AI para analizar y comprender los procesos emprendedores.

Limitaciones de la investigación: como cualquier propuesta conceptual se simplifica a propósito, lo que puede ser una desventaja.

Hallazgos: se sugiere desde la AI analizar la historia del emprendimiento, ya que el artefacto puede brindar información específica y valiosa sobre los procesos bajo los cuales fue conceptualizado, diseñado, producido, vendido, adaptado u obsoleto, y el impacto que tuvo este en la empresa.

Palabras clave: emprendimiento, Historia, Arqueología Industrial, artefacto.

INTRODUCTION

Entrepreneurial history has been approached mainly from its actors, hierarchies, or institutions involved. Therefore, a call to reinvent it as a research field was made by Wadhwani and Lubinski (2017), focusing on opportunities, resources, and novelty. [1]

Welter (2011) suggests that when studying the context of entrepreneurship, it's not only those elements that from outside affect it, but also is superlative to approach how the entrepreneur itself engages and builds them, as Baker and Welter (2020) call "doing contexts".

Instead of reinventing (an apology of its multidimensionality indeed) or theorizing on context by focusing on place (Welter and Baker, 2020), the present paper focused on an understudied approach in entrepreneurship: artifacts, its outcomes, i.e., products and services, to determine under what mechanisms artifacts can be employed to build up a history embedded within an entrepreneurial project (its processes), shedding a novel, new in-depth, multidimensional analysis of entrepreneurship.

As an alternative to the past and current trend, what about telling the entrepreneurial story backward, from the outcomes (creative processes reflected in products or services) of the new venture or firm? Therefore, in the Theory section an overview of the close relationship between entrepreneurship and history is presented, its diverse historical approaches for research, and a brief introduction about what Industrial Archeology (IA) is, in section three Method, a description of how the scarce literature on the proposal was review and selected, in section four an explorative proposal on how the principles of IA can be applied to entrepreneurship under a historical lens, and including a field format to use and apply, and in conclusions a standpoint on how this proposal can build a whole new panorama for doing the history of entrepreneurship. That is precisely the modest scientific contribution, IA method applied not only to technology, infrastructure, or installations, or premises but to entrepreneurship on products and services.

LITERATURE REVIEW

Entrepreneurship and History

Lu *et al.* (2020) in their recent study on the evolution process of entrepreneurship, shows how history studies on entrepreneurship have been an understudied research stream. Not only that, but their study was also done only considering top journals from North America and Europe, therefore, neglecting any research the Latin America region produced and inferring that there is not any valuable research in our area. Mainly, this has been addressed by the individual entrepreneur, the firm, the region where the entrepreneurial experience took place, and the context under these processes was carried out but forgetting the outcomes that were

produced because of this. Wadhwani and Lubinski (2017) propose to reinvent entrepreneurial history as a research field, approaching its study on the creative processes that propel economic change.

Wadhwani and Jones (2014) make a call to build on several lines of historical theory about time, context, and change, and apply them to entrepreneurship theory so they can illuminate aspects of the entrepreneurial process. Different historical approaches towards entrepreneurship research have been used (see Table 1), where the archeological or anthropological one is missing. Therefore, as Table 1 shows, the link between IA, Entrepreneurship, and artifacts have not been explored deeply, since it is still considered micro-history, and the sources are letters, nor to say that in any of the other approaches, it is not even considered as a source.

The first blur proposal of a potential link between entrepreneurship and archeology was done by MacMillan and Katz (1992). Many of the things society use and consume daily has been modified, e.g., mass production, even food preparation, leaving traces valuable for the archaeological record. The structural and related artefactual, and textual remains associated with production can give valuable information: *workflow*, spatial settings, socio-economic aspects, manufacturing activities, control of resources and finished goods (Hodgkinson and Tvetmarken, 2020).

Artifacts are already a well-known document in the history of technology (Jenkins, 1987; Clarkson and O'Connor, 2006; Petrullo and Barich, 2020), recommended to be also as a potentially viable approach for business historians (Hansen, 2012). They are beginning to win attention in the entrepreneurship literature seeing opportunities as artifacts (Berglund, Bousfiha, and Mansoori, 2020), since exploring the mechanisms between entrepreneurial processes and historical change are central (Wadhwani and Lubinski, 2017).

Table 1.
Historical approaches to entrepreneurship research

Approach	Socio-economic history	Cultural history	Microhistory	Comparative history	Historical case studies
Exemplar	Ruef	Demil	Hollow	Godley and Hamilton	Toms, Wilson, and Wright
Sources	Census data	Industry/firm records	Personal letters	Data; Oral histories	Published sources
Interpretation	Variable-based	Processual	Emergent	Processual	Variable-based
Assumption @ Sensemaking	Universal	Situated	Situated	Situated, universal	Universal
Causation	Test	Narrative	Narrative	Comparison	Comparison
Main contribution	Household and labor market institutions determine the propensity to own firms because they shape entrepreneurs' ability to control the work of others.	Administrative categories demonstrate the role of the state in shaping Entrepreneurial opportunities, in particular by making counting possible.	Evolving socio-materiality of entrepreneurial networks; co-evolution of social movements and entrepreneurial networks; dialogical construction of contexts within networks.	Collective memories shape entrepreneurial perceptions of uncertainty and play a role in their propensity to engage in strategic alliance formation.	Product market innovation interacts with the quality of financial intermediation to determine the scope of entrepreneurial opportunities in a historical setting.
Other research applications	Variations over time in the relationship between entrepreneurial activity and (1) social structures and affiliations. (2) The resource environment. (3) Legal forms of organization. (4) Patterns of agglomeration.	(1) Studies of complex multilevel social processes. (2) Antecedents, contexts, and consequences of cultural entrepreneurship. (3) Conceptual and critical histories of entrepreneurial constructs.	(1) Studies of sensemaking and effectuation. (2) Research on the emergence of routines. (3) Studies of entrepreneurial practices and **artifacts**. Entrepreneurial uses of history.	(1) Studies of complex multilevel social processes. (2) Studies of how entrepreneurs perceive and grapple with uncertainty.	(1) Studies of the causes of opportunities. (2)Theory development of new or emerging phenomenon.

Source: Wadhwani *et al*. (2020).

In the latter, examining the social and cultural factors involved in the entrepreneurial activity are key in the decision to create new businesses, arguing that entrepreneurship is embedded in a social context (Aldrich and Zimmer, 1986).

Thornton, Ribeiro-Soriano, and Urbano (2011) pointed out that social and cultural factors are embedded in the entrepreneurial process, i.e., Idea Generation, Opportunity Evaluation, Planning, Company formation/ launch, and Growth. In the social factors, social capital, are the tangible resources (including also those digital) that facilitate actors' achievement of goals and that accumulate to actors through a social structure (Portes, 1999), Social Networks, a set of actors (individuals and/or organizations) and linkages between them (Brass, 1992), suggesting both promote that economic exchange is socially embedded (Granovetter, 1985).

Culture has relevance for entrepreneurship (Shane, 1993). The individual develops different Cultural Values influencing, e.g., the decision or not to create startups. Hofstede (1980) sees Cultural Values as the collective programming of the mind, that distinguishes someone, and the way approaches the environment. Therefore, when creates a business in a cultural environment, this person will reflect these values (Hayton, George, and Zahra, 2002).

Thus Thornton, Ribeiro-Soriano, and Urbano (2011) acknowledge that the problem of integrating social and cultural factors that affect entrepreneurship is challenging. That allows exploring a rich path that potentially can shed light on the history of entrepreneurship through analyzing artifacts.

Industrial Archaeology and Entrepreneurship

Anthropology, closely related to IA, sees entrepreneurship and other social processes under a cultural lens (e.g., Greenfield and Strickon, 1986; Stewart, 1991). Norms and traditions can foster or inhibit entrepreneurship. Attention has been given to social and cultural factors related to the creation of new business because of social constraints (Kennedy, 1988; Wiewel and Hunter, 1985) and collective approaches (e.g., family business, community-centered business-like cooperatives) to business formation and growth (Davis and Ward, 1990; Parker, 1988).

Palmer and Nevearson (1998) defined IA as "the systematic study of structures and artifacts as a means of enlarging our understanding of the industrial past" (p. 1), the study of the tangible evidence of social, economic, and technological development since industrialization. In the case of structures, they state that "the industrial monument is but one part of a network of linkages relating to the methods and means of past production, and that its location, form, and development are the result of individual human decisions" (p. 14) (e.g., entrepreneurship), its significance in technological and economic terms, and cultural meaning, a symbol of changing human relationships.

For example, Menuge (1993) tells about Arkwright's first cotton mill, erected in 1771, where the site had a high perimeter wall, and no ground-floor windows overlook the mill road, indicating he was so concerned over the secrecy in which his newly patented machines operated. The mill yard's layout also enabled close supervision of the workforce. A strategy that might resemble how today's companies protect their patents (a key element on any technological entrepreneurial project) build into their products or confidentiality agreements on the business's system on the services offered.

As Hodder (1982) has argued, material culture is but an active constituent of society, not a passive reflection of it, deliberately used by individuals to negotiate social position or social change. Palmer and Nevearson (1998) consider industrial buildings are the visible symbol of the processes of production in both space and time. So the same can be said about the artifacts these premises were designed to build or produce, where its analysis requires the use of the archaeological concepts, like their function and context (the study of the artifacts in its cultural context, to understand its symbolism, e.g., entrepreneurial processes).

In the case of products, let's consider them as artifacts, "the result of a more or less explicit design and a more or less controlled manufacturing process: a standard to be identified by archaeologists and variability to be explained (hazards of manufacturing, quality, reproducibility, personal style, etc.)" (Djindjian, 2001, p. 41). He also states that this definition may also be applied to "logical" facts, like a set of "physical" things, i.e., services. Artifacts are seeing as the historic remains of the behavior once presented by a firm (Reischauer, 2015) or an individual.

Djindjian (2001) mention different roles artifacts play in archeology studies that also can be applied to entrepreneurship:

- Artifact identification and classification;
- "Culture" identification;
- Seriation (chronology from artifacts);
- Artifact spatial distribution studies;
- Identifying raw material sources and manufacturing centers (artifact production subsystem studies);
- Identifying distribution networks (artifact exchange and trading subsystem studies);
- Intersite spatial analysis (artifact for territory identification, peopling, carrying capacity, demography as well as time and space changes).

Too much emphasis is placed on the entrepreneur, the entrepreneurial project (firm), and the context. But what about the products and services developed because of this entrepreneurial dynamic? Artifact analysis considers artifacts as products of human actions (Reischauer, 2015). Human activity is carried out through actions (B#dker and Klokmose, 2011). Just like entrepreneurship, is the scale, the consequence of the entrepreneurial experience (Pauls, 2006), the agency, the interpretation of the "absent presence" behind the artifacts, the force driving the process

of history, the assemblage of a palimpsest of individual activities (Hall and Silliman, 2006).

So, the artifact is an extension of those elements that influence the entrepreneurial project, the latter affected by social, cultural, and institutional processes. Formal and informal institutions can legitimize and delegitimize business activity (Aidis, Estrin, and Mickiewicz, 2008; Veciana and Urbano, 2008; Welter, 2005).

Artifacts have a permanent dialectical relationship with previous artifacts and practices, therefore, using historical analysis will support a deeper understanding of their practice and use in a given historical and market context (B#dker and Klokmose, 2011). As in entrepreneurship, Labadi (2001) make a call for IA to have a multidisciplinary approach to its study using a variety of subjects, approaches and methods have been stressed, and even suggest that the main aspect of IA should be the study and explanation of people at work in different settings, i.e., entrepreneurship.

"An artifact has a story to tell about the person who made it, how it was used, who used it, and the beliefs and values associated with it" (Norum, 2008, p. 23). The artifact is a mediator of human activity (B#dker and Klokmose, 2011), thus the history of the artifact is the history of the entrepreneur / entrepreneurial project/business.

METHOD

An extensive literature review, under a Boolean code, was carried out through the university's database integrator (number of the results-year period), which has access to multiple databases, books, journals, etc. (e.g. EBSCOhost, ProQuest, Scopus, Emerald, Ingenta, JSTOR, ScienceDirect, and Wiley), using *industrial archaeology and entrepreneurship (987, 1993-2020), industrial archaeology and artifacts and entrepreneurship (707, 1993-2020),* and *industrial archaeology and history and entrepreneurship (974, 1993-2020)*. Also, by Google Scholar with keywords *entrepreneurship artefact artifact history sociology (18200 hits), entrepreneurship artefact artifact history anthropology* (17600 hits), *entrepreneurship artefact artifact history business* (3550 hits), *artefact artifact history business* (2780 hits). No evidence of a prior perspective like the proposal here presents was found. The main criteria/goal was to find a perspective where the artifact, as the subject, under an analysis made on it, can provide a novel view into the history of entrepreneurship. No article was found.

One or several approaches to analyze the artifact may be use according to on the artifact under review. These might consider various approaches (content, discourse, document, historical, semiotics, and narrative analyses) (Norum, 2008).

Annex A is designed to follow Wadhwani (2016) suggestion on making historical contextualization, defined it as "the analysis or interpretation of the past event(s), concerning their time and place, in ways that address a question or problem that arises in the

present" (p. 134), where different sources can be obtained, like magazines, documents, newspapers, archives, where making triangulation (the use of multiple sources, and types of sources, to examine a research question) is a must-do task to increase the validity of our analysis and conclusions, by contrasting them. Regarding interpretative methods, under a hermeneutic interpretation, that might include its critical lens.

Results and Discussion: An explorative view on ia Methods apply to Entrepreneurship

According to Major (1975), IA has nine categories: coal and metals, power, textiles (including pottery and glass), food preparation, brewing and distilling, transport, building materials, agricultural industry, housing for industrial workers, public services, and industry of recreation. Today, it might include the digital industry (like a Facebook page or blogs, digital documents today part of many people's everyday life), among others (like intangibles services, that are suggested to fit into what the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2003) defines as "cultural heritage", where this definition is further broken down into "intangible" and "tangible" cultural heritage, where both are intrinsic to one another and are juxtaposed, i.e., an insurance policy, traditions that are manifest, i.e., folklore dances where the participants wear specific clothes). He recommends, to begin analyzing, three different surveys: a survey of the industry in each area, of a single industrial unit, and an area or unit in an emergency.

Alfrey and Putnam (1992) suggest an alliance of histories based on artifacts, so they see industrial archaeology as a key science for understanding contemporary society. Just like entrepreneurship is. Link them together seems a natural fit for both. But surprisingly, it is well understudied.

It is proposed that linking IA and entrepreneurship can allow researchers the opportunity to examine the relationship between institutions, opportunities, and entrepreneurial behaviors (Wadhwani and Jones, 2014). Artifact has been of interest in entrepreneurship, from the perspective of artifact-creating processes (Selden and Fletcher, 2015) and in entrepreneurial design (Selden and Fletcher, 2019). Entrepreneurship is built upon social networks, relationships brought together (e.g., financial and human capital), held and share by its members and not by an individual (Burt, 1992), the artifact can be the right tool to analyze how this dynamic took place.

Furthermore, the social embeddedness (social capital and social network) perspective emphasizes that entrepreneurial agency, the capacity to amass entrepreneurial ideas and the resources needed is shaped by the social context (norms and manners) (Thornton, Ribeiro-Soriano, and Urbano, 2011). These authors stated entrepreneurs usually have the necessary resources (e.g., ideas, knowledge), as well as others they might need and get from its social networks (e.g., information, capital, labor)

to produce and deliver their goods or services (Greve and Salaff, 2003; Ribeiro-Soriano and Urbano, 2009).

There have been several studies approaching the history of technology or entrepreneurship, from the industry, companies involve, entrepreneurs, or on the cultural meaning of the objects or artifacts. For example, Batiz-Lazo and Reid (2008), on the birth of currency dispensing equipment, the immediate predecessor to the Asynchronous Transfer Mode (ATM), directing it on the understanding of the process of innovation itself. Coopersmith (2015), approaching the rise and fall of the fax machine, from a deep industry and companies involve analysis of that era, similar of what Field, Senechal, and Shaw (2007) did, outlining the companies' often-complicated histories (case studies), focusing on entrepreneurs, innovation in technology and marketing and products, or the classical tale of the Synthesizer replacing piano and organ (Pinch, 2001). Berger (2014) has been approaching objects (like blue jeans, smartphones, books, Facebook) as an introduction to material culture, studying its meaning in society.

But in them, an analysis like the present paper propose has been missing. Today, products and services out of those nine categories can also be analyzed ("how entrepreneurial places emerge, persist, and vanish", Welter and Baker, 2020, p.5), and with it build the history of the entrepreneurship responsible for their existence:

a) Genesis;
b) Transformation due to market feedback or changes;
c) Consolidation and upgrades;
d) The decline of the product/service, and with it the founder/firm itself.

Reischauer (2015) proposes two stages. First, the artifact is deconstructed in its material context and its usage context in workday life. In the second, the artifact is related to the organizational context, and applied to entrepreneurship, in its process, on a multilevel analysis (founder, family, if the case, firm, community, region).

Also, as in IA (Major, 1975), background research must be done. Museums, maps, guidebooks, directories, local histories, deposited plans, catalogs, auction documents and deeds, postcards, photographs, and engravings, can be used. In entrepreneurship, that implies making a thorough analysis of every entrepreneurial stage the founder or firm went through (entrepreneurial exploration, discovery and opportunity, exploitation, and effectuation approaches, the cognitive issues on the individual, process, as well as practices, and the ecosystem dynamic).

Regarding Genesis, it is a must to obtain the initial drawings, and a full description of its main and relevant materials or devices that compound it, so a mix of stories can be blended since each of them has its own story to tell, so a multidimensional (Montiel and Rodríguez, 2017; Turcan and Fraser, 2018), and interdisciplinary (Welter, 2011) array of approaches can be told on the history of entrepreneurship. Interviews with the I & D team, or the founder and the initial startup's team.

In Transformation, how the minimum viable product was launch and how was change due to market feedback and response. Interviews with the I & D team or the founder and the initial startup's team also should be done, along with documents, materials, supplier selection, drawings, digital, and newspaper archives.

In Consolidation and upgrades, in addition to all the above, what kind of technological changes within its industry or in other areas did affect the artifact or service the firm offered. In Decline, what kind of changes in the industry, market, on the founder itself, organizational culture, the firm went, and that ultimately were reflected in poor product performance or bad design so that it affected the firm viability.

Annex A shows a proposal on what a potential analysis can be made applying IA into entrepreneurship, stating first that there is no one right way to analyze artifacts (Norum, 2008). In sections 1 through 4, the artifact is under a deep review (type, qualities, uses, and the "narrative" it can have on its embodied entrepreneurial processes). In section 5, there is a reflexive area for the researcher, in section 6 an exploration of what interpretation from the entrepreneurship standpoint it can be made as a first step towards the artifact, "creative ways they use the past to imagine the future" (Wadhwani and Lubinski, 2017, p. 11). It is included creativity, innovation since both are intertwined with entrepreneurship. Finally, section 7 is open for all the graphical or digital, or physical information to be collected.

For example, a quilt made around the time of the U.S. Civil War can tell us ideas about abolition, how they raise funds or bury a soldier, and the materials about what resources were available to the quilt maker (Norum, 2008). In Annex B, a brief and exploratory example is done to show how the proposal can be applied, in this case, to analyze the fax machine.

Wadhwani (2016) suggests 3 other historical techniques that can be used and applied in conjunction with source, triangulation, and hermeneutic interpretation with potential relevance to contextualization in entrepreneurship research, structural history, microhistory, and conceptual history. The present proposal can be used in all those techniques.

Structural history, which looks for multiple temporal perspectives to support the interpretation or analysis of events, incorporating longer temporal spans, processes of change in social and economic conditions, and geographic and biological developments, for example, starting by the genesis of the concept from a product or service, its design, materials selection, prototype building, its production and marketing process, the industry conditions of the time, persistent structural factors shaping entrepreneurial behaviors and processes, and the decisions behind them.

Microhistory, looking in fine-grained detail at instances, like start-ups or the entrepreneur itself both embodied into a specific time and context, where the product/service and its genesis and development according to the market or customer needs shape both. And conceptual history, tracing the shifting ways in which key terms are developed and used as an essential and independent factor in historical processes and in how

contextualization occurs (Koselleck 2002), shaping the entrepreneur, its entrepreneurial project, the whole industry, and society (cultural shifts), as the artifact is being used by the customer. The historical approaches in table 1 also can be enriched by using it.

Linking IA and entrepreneurship not only is a novel view for both research streams, can enrich the historical view on entrepreneurship (like in the structuralism and sequencing approaches), but also a matter of social justice in terms of the memory of work (Castillo, 2011), key element of the industrial culture today.

The present article demonstrates, as suggested by Wadhwani *et al*. (2020), that historical reasoning, data sources, and methods of interpretation (i.e., IA apply to entrepreneurship) represent a significant opportunity to advance the research agenda of history and entrepreneurship.

CONCLUSIONS

A call is made to envisioning and analyze historically the entrepreneurial process from a different perspective. Exploring its outcomes, artifacts, products, and services, including those digital under the IA umbrella, might help to understand more deeply how entrepreneurs do or did contexts. Perspectives on the history of entrepreneurship from this angle can shed light on a new way of seeing and understanding the history behind an entrepreneurial project or the founder's and family dynamics, in the case of a family business.

This link between IA and entrepreneurship can be linked to entrepreneurial exploration, discovery and opportunity, exploitation, and effectuation approaches, as well as the cognitive issues on the individual, processes, as well as practices, and ecosystem. A domino effect to be approach since it is reflected ultimately in the artifact.

Therefore, it is expected to contribute in greater depth and sophistication to our understanding by providing a critical engagement with notions of the historical development of business around the world, elaboration of its presence in expected and unexpected venues (both geographically and across time), and the implications and effects of this business presence on society more generally. It also provides a venue for developing a dialogue with other branches of historical research and social science disciplines by illustrating the significance of entrepreneurship history research. It is necessary to contrast the proposal here presented against other historical methods, which might improve its potential.

References

Aidis, R., Estrin, S. and Mickiewicz, T. (2008). Institutions and entrepreneurship development in Russia: A comparative perspective. *Journal of Business Venturing, 23*(6), 656-672.

Aldrich, H. and Zimmer, C. (1986). Entrepreneurship through social networks. In D.L. Sexton and R.W. Smiler (Eds.). *The Art and Science of Entrepreneurship*. Cambridge, MA: Ballinger, 3-23.

Alfrey, J. and Putnam, T. (1992). *The Industrial Heritage: Managing Resources and Uses*. London: Routledge.

Almaraz, A. and Montiel, O. (2020). *The History of Entrepreneurship in Mexico: Contextualizing Theory, Theorizing Context*. Bingley: Emerald Publishing.

Baker, T. and Welter, F. (2020). *Contextualizing Entrepreneurship Theory*. New York: Routledge.

Bátiz-Lazo, B. and Reid, R.J.K. (2008). Evidence from the Patent Record on the Development of Cash Dispensing Technology. *MPRA Paper 9461*. Retrieved from https://mpra.ub.uni-muenchen.de/9461/

Berger, A. (2014). *What objects mean: an introduction to material culture (2nd. edition)*. New York: Routledge.

Berglund, H., Bousfiha, M. and Mansoori, Y. (2020). Opportunities as Artifacts and Entrepreneurship as Design. *Academy of Management Review, 45*(4). https://doi.org/10.5465/amr.2018.0285

B#dker, S. and Klokmose, C. (2011). The Human-Artifact Model: An Activity Theoretical Approach to Artifact Ecologies, Human-Computer *Interaction, 26*(4), 315-371. https://doi.org/10.1080/07370024.2011.626709

Brass, D. J. (1992). Power in organizations: A social network perspective. *Research in Political Sociology 4*, 295-323.

Burt, R.S. (1992). *Structural Holes*. Cambridge, MA: Harvard University Press.

Castillo, J. (2011). The Memory of Work and the Future of Industrial Heritage: New Issues Five Years Later [40 paragraphs]. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 12*(3), 1-14. Retrieved from http://nbn-resolving.de/urn:nbn:de:0114-fqs110333.

Clarkson, C. and O'Connor, S. (2006). An Introduction to Stone Artifact Analysis. In Jane Balme and Alistair Paterson (Eds.), *Archaeology in Practice: A Student Guide to Archaeological Analyses*. Oxford, UK: Blackwell Publishing Ltd, 159-206.

Coopersmith, J. (2015). *Faxed: the rise and fall of the fax machine*. Baltimore, Maryland: Johns Hopkins University Press.

Davis, D.R. and Ward, M.D. (1990). The entrepreneurial state: Evidence from Taiwan. *Comparative Political Studies, 23*, 314-333.

Djindjian, F. (2001). Artefact Analysis. In Z. Stančič and T. Veljanovski (Eds.). *Computing Archaeology for Understanding the Past* (pp. 41-52) Oxford: Archaeopress. Retrieved from https://proceedings.caaconference.org/files/2000/07_Djindjian_CAA_2000.pdf.

Field, J., Senechal, M. and Shaw, M. (2007). *American Silk, 1830-1930: Entrepreneurs and Artifacts*. Costume Society of America Series. Lubbock: Texas Tech University Press.

Granovetter, M. S. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology, 91*(3), 481-510.

Greenfield, S.M. and Strickon, A. (1986). Introduction. In Greenfield S.M. and Strickon, A. (Eds.). *Entrepreneurship and Social Change* (4-18). Lanham, MD: University Press of America.

Greve, A. and Salaff, J.W. (2003). Social networks and entrepreneurship. *Entrepreneurship Theory and Practice, 28*(1), 1-20.

Hall, M. and Silliman, S. (2006). *Historical archaeology.* London: Blackwell Publishing.

Hansen, P.H. (2012). Business History: A Cultural and Narrative Approach. *The Business History Review, 86*(4), 693-717. Retrieved from https://www.jstor.org/stable/41809691

Hayton, J. C., George, G. and Zahra, S.A. (2002). National culture and entrepreneurship: A review of behavioural research. *Entrepreneurship Theory and Practice, 26*(4), 33-52.

Hodder, I. (1982) *Symbols in Action.* Cambridge, UK: Cambridge University Press.

Hodgkinson, A. and Tvetmarken, C. (2020). *Approaches to the Analysis of Production Activity at Archaeological Sites.* United Kingdom: Archaeopress Publishing Ltd.

Hofstede, G. (1980). *Culture's Consequences: International Differences in Work-related Values.* Beverly Hills, CA: SAGE.

Jenkins, R. (1987). Words, Images, Artifacts and Sound: Documents for the History of Technology. *British Journal for the History of Science, 20*(1), 39-56. https://doi.org/10.1017/S0007087400000480

Kennedy, P. (1988). *African Capitalism: The Struggle for Ascendancy.* New York: Cambridge University Press.

Koselleck, R. (2002). *The Practice of Conceptual History: Timing History, Spacing Concepts.* Palo Alto, CA: Stanford University Press.

Labadi, S. (2001). Industrial Archaeology as Historical Archaeology and Cultural Anthropology. *Papers from the Institute of Archaeology, 12,* 77-85. http://doi.org/10.5334/pia.162

Lu, R., Lu, Q., Lv, D., Huang, Y., Li, S., Jian, Z. and Reve, T. (2020). The Evolution Process Of Entrepreneurship Studies In The 21st. Century: Research Insights From Top Business And Economics Journals. *Journal of Economic Surveys, 34*(4), 922-951. https://doi.org/10.1111/joes.12365

MacMillan, I. and Katz, J. (1992). Idiosyncratic Milieus of Entrepreneurial Research: The Need for Comprehensive Theories. *Journal of Business Venturing, 7*(1), 1-8. Retrieved from https://ssrn.com/abstract=1505855

Major, K. (1975). *Fieldwork in Industrial Archeology.* Sydney: B.T. Batsford Ltd.

Menuge, A. (1993). The cotton mills of the Derbyshire Derwent and its tributaries. *Industrial Archaeology Review, 16*(1), 38-61.

Montiel, O. and Rodríguez, C. (2017). *Emprendimiento Hoy. Multidimensionalidad, Cambio e Innovación.* Ciudad Juárez, México: Universidad Autónoma de Ciudad Juárez.

Norum, K. E. (2008). Artifact Analysis. In L. M. Given *The Sage Encyclopedia of Qualitative Research Methods* (pp. 23-25). Thousand Oaks, CA: Sage Publications.

Palmer, M. and Neaverson, P. (1998). *Industrial Archaeology, Principles and practice.* London, UK: Routledge.

Parker, B. (1988). Moral economy, political economy, and the culture of entrepreneurship in highland Nepal. *Ethnology, 27,* 181-194.

Pauls, E. (2006). The Place of Space: Architecture, Landscape, and Social Life. In Hall, Martin and Silliman, Stephen. *Historical archaeology*. United States: Blackwell Publishing.

Petrullo, G. and Barich, B.E. (2020). The Bone Artifact Collection from Wadi Ti-n-Torha (Northern Tadrart Akakus, Libya): A Reappraisal Based on Technological Analysis. *African Archaeology Review*. https://doi.org/10.1007/s10437-020-09374-x

Pinch, T. (2001). Why Do You go to a Piano Store to Buy a Synthesizer: Path Dependence and the Social Construction of Technology. In Raghu Garud and Peter Karnoe (Eds.). *Path Dependence and Creation* (pp. 381-401). New York: PsychologyPress. https://doi.org/10.4324/9781410600370

Portes, A. (1999). Conclusion: Towards a new world-The origins and effects of transnational activities. *Ethnic and Racial Studies, 22*(2), 463-477.

Reischauer, G. (2015). Combining Artefact Analysis, Interview and Participant Observation to Study the Organizational Sensemaking of Knowledge-Based Innovation. *Historical Social Research, 40*(3), 279-298. https://doi.org/10.12759/hsr.40.2015.3.279-298

Ribeiro-Soriano, D. and Urbano, D. (2009). Overview of collaborative entrepreneurship: An integrated approach between business decisions and negotiations. *Group Decision and Negotiation, 18*(5), 419-430.

Selden, P. and Fletcher, D. (2015). The entrepreneurial journey as an emergent hierarchical system of artifact-creating processes. *Journal of Business Venturing, 30*(4), 603-615.

Selden, P. and Fletcher, D. (2019). The tacit knowledge of entrepreneurial design: Interrelating theory, practice and prescription in entrepreneurship research. *Journal of Business Venturing Insights,* 11, e00122. https://doi.org/10.1016/j.jbvi.2019.e00122.

Shane, S. (1993). Cultural influences on national rates of innovation. *Journal of Business Venturing, 8*, 59-73.

Stewart, A. (1991). A prospectus on the anthropology of entrepreneurship. *Entrepreneurship Theory and Practice, 16*(2), 71-91.

Thornton, P. H., Ribeiro-Soriano, D. and Urbano, D. (2011). Socio-cultural factors and entrepreneurial activity: An overview. *International Small Business Journal, 29*(2), 105-118. https://doi.org/10.1177/0266242610391930

Turcan, R. and Fraser, N. (2018). *The Palgrave Handbook of Multidisciplinary Perspectives on Entrepreneurship*. United Kingdom: Palgrave MacMillan.

United Nations Educational, Scientific and Cultural Organization [UNESCO] (2003). *Text of the Convention for the Safeguarding of the Intangible Cultural Heritage*. Retrieved from https://ich.unesco.org/en/convention

Veciana, J.M. and Urbano, D. (2008). The institutional approach to entrepreneurship research: An introduction. *International Entrepreneurship and Management Journal, 4*(4), 365-379.

Wadhwani, D. (2016). Historical Methods for Contextualizing Entrepreneurship Research. In F. Welter, and B. Gartner (Eds.), *A Research Agenda for Entrepreneurship and Context* (pp. 134-145). United Kingdom: Edward Elgar Publishing. https://doi.org/10.4337/9781784716844.00015

Wadhwani, D. and Jones, G. (2014). Schumpeter's Plea: Historical Reasoning in Entrepreneurship Theory and Research. In Marcelo Bucheli and Daniel Wadhwani (Eds.). *Organizations in Time: History, Theory, Methods.* (pp. 192-216). Oxford, UK: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199646890.003.0008

Wadhwani, D. and Lubinski, C. (2017). Reinventing Entrepreneurial History. *Business History Review, 91*(4), 767-799. https://doi.org/10.1017/S0007680517001374

Wadhwani, D., Kirsch, D., Welter, F., Gartner, W. and Jones, G. (2020). Context, time, and change: Historical approaches to entrepreneurship research. *Strategic Entrepreneurship Journal, 14*(1), 3-19. https://doi.org/10.1002/sej.1346

Welter, F. (2005). Entrepreneurial behavior in differing environments. In D.B. Audretsch, H. Grimm, and C.W. Wessner (Eds.). *Local Heroes in the Global Village Globalization and the New Entrepreneurship Policies* (93-112). International Studies in Entrepreneurship, New York: Springer.

Welter, F. (2011). Contextualizing Entrepreneurship-Conceptual challenges and ways forward. *Entrepreneurship Theory and Practice, 35*(1), 165-184. https:// doi.org/10.1111/ j.1540-6520.2010.00427.x

Welter, F. and Baker, T. (2020). Moving Contexts Onto New Roads: Clues From Other Disciplines. *Entrepreneurship Theory and Practice.* https://doi.org/10.1177/1042258720930996

Wiewel, W. and Hunter, A. (1985). The interorganizationat network as a resource: A comparative case study on organizational genesis. *Administrative Science Quarterly, 30,* 482-496.

Annex B

1.	**TYPE OF ARTIFACT: FAX MACHINE**. EARLY YEARS.** Describe the material from which it was made: bone, pottery, metal, wood, stone, leather, glass, paper, cardboard, cotton, plastic, fabric, other material. Give as much detail as possible. Plastic, copper wire, some metal pieces.
2.	**QUALITIES OF THE ARTIFACT** Observe its parts. Describe how it looks and feels: shape, color, texture, size, weight, movable parts, anything printed, stamped, *condition, movable parts, or anything written on it.* Modern fax model: Rectangular, black, soft, medium size (30cm x 30cm), 2 kgs, it has movable parts (paper tray, roller, handset)
3.	**USES, ARTIFACT** What might it have been used for? List reasons you think so. To ease and speed the communication of data, images. Who might have used it? An individual working in an office. Where might it have been used? Office, home, businesses, from 1980-2000. In his fax history, Coopersmith (2015) reveals that facsimile users did not exist; they had to be created. Successfully understanding its needs and convincing them to fax—proved to be as challenging as developing the actual technology. It goes on to mention that faxing first found success in filling smaller, more specific niches (newspapers, militaries, and large corporations). When might it have been used? Peak market and popular between 1980-1995. Did different people use it in different ways? Yes, to transfer documents, drawings, printed images.
4.	**ARTIFACT'S NARRATIVE:** What does it tell you about the technology of the time in which it was made and used? Coopersmith (2015) mentions that Alexander Bain, an englishmen, file for a patent in 1843. In 1846-48 he built a new fax machine, where the sender wrote a message with a non-conducting ink on tin foil or paper coated with Dutch metal (a thin leaf of brass). Weights unwinding by clockwork synchronized the pendulums and moved the stylus gradually across the rotating cylinder, amazing observers by sending images through a wire. Later, in 1848, F.C. Blackwell receive a rivalry patent and became an endless judicial process between them. What does it tell you about the life and times of the people who made it and used it? Sometimes technological breakthroughs to assure market success, it is not accomplished even if the technology is groundbreaking, due, to market inefficiencies and conditions, simply did not exist at that time. The entrepreneurial role of visionaries and the persistence of innovators, patrons, promoters, and investors (they were successful in other areas, were not naïve) on repeated failure; aspects of mass culture and commercial context that influence in the earlier acquisition by the market of this technology. Can you describe a similar item in the recent past or today? Today, a smartphone with a scanner app, multifunctional printer.

An explorative, brief example on Artifact Analysis Worksheet

Analysis based on Coopersmith's (2015), including images. "...continue on next page"

Reflexive section:

Where is it from?

It came from the UK and France first, with some other attempts from the United States.

When is it from?

It dates to 1843.

What was happening in society or history at the time the artifact was made?

Coopersmith (2015) states that this episode in telecommunications history illustrates how promoters, patrons, and potential users normally backed competing technologies to reduce their risk and maximize their options.

After 1880 with the appearance of the selenium photoelectric cell, new newspapers emerge in Europe and the United States. Two decades more passed before actual newspaper use emerged, but commercial success remained elusive for picture telegraphy (pt) until after World War I (Coopersmith, 2015).

What meaning did the artifact have for the users?

In the beginning, curiosity and amazed by the achievement of the fax underlying technology.
Has its meaning or use changed over time?

Yes, it was too expensive.

Does the meaning differ for different users?

Yes, for some markets, especially newspapers, was very attractive.

If it was created elsewhere, how did this person or group of people acquire it?

The technology was developed by entrepreneurs located in England, France, United States.

What does it say about the people who made it? and used it? Who cannot or did not use it?

In the beginning, there were investors, with not enough entrepreneurial skills. Most of them sold their patents to established companies.

What does it say about technology at the time it was made?

The technology was revolutionary. Way ahead of its time to be economically feasible.

Coopersmith (2015) makes a relevant point: technology history usually focus on success and minimize if not exclude failure. Entrepreneurial failure.

Faxing's history shows a technology does not just emerge. It has to be pulled, pushed into an entrepreneurial project, and dynamic.

Coopersmith (2015) view faxing as a failed technology. First, since 1843, inventors and entrepreneurs repeatedly promote fax in multiple marketplaces and usually failed, and then in the mid-80s where lost its primacy due to the internet.

Used it as historical evidence:
What did you find out from this artifact that you might not learn anywhere else?

The fact that fax technology was much older than previously thought. It was a huge surprise.

What other documents or historical evidence can help understand the event or time this artifact was used?

The business history of the companies involves early in its development and adoption, as well as the first users and the impact it had on their business and processes.
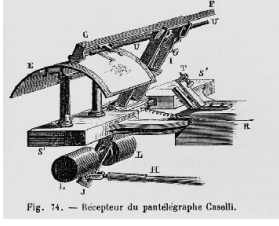
An explorative, brief example on Artifact Analysis Worksheet (...continued)
**Analysis based on Coopersmith's (2015), including images. "... continue on next page"

Entrepreneurship section:

What entrepreneurial processes (a, b, etc.) can be analyzed in terms of:

a) Entrepreneurial discovery

Coopersmith (2015) follows the process where finally a technology breakthrough supported the feasibility of fax. In 1873, Willoughby Smith and Joseph May, serendipitously discover selenium's electrical resistance use.

Very quickly researchers in Europe and the United States began trying to transmit still and moving images electrically via selenium.

b) Opportunity recognition

Fear was key to the success of fax technology. Fear of being left behind versus competitors, the possibility of missing a new opportunity. That was what its promoters used.

"The hope of hitting the next big thing induced governments, organizations, firms, and individuals to invest" (Coopersmith, 2015, p.5).

c) Entrepreneurial exploitation

Fax promoters view World War I and II, the long-awaited opportunity, and exploded it. The military sector needed nearly real-time transmission of maps, drawings, and photo facsimile, graphs, information flow.

d) Effectuation approaches and processes

By combining two technologies, AT&T begins offering its telephone customers "wire photo", a fax service.

> "In 1940, wire photo served 726 newspapers in the Americas, 120 directly and 606 by a combination of faxing and mail. As subscribers increased, however, so did AT&T's revenues from leasing—wire photo accounted for a quarter of the Associated Press's (AP) 1940 $1.7 million telephone bill. Facsimile had finally earned a profit" (Coopersmith, 2015, p. 57).

e) Cognitive issues on the individual

Interesting, a. Bain was a master researcher but lack of entrepreneurial psychological competencies. He had intemperance and a ready willingness to sue, against better-funded opponents. He was a self-made man, and that sure affected him.

Litigious relations distract him from improving and commercializing his inventions. In his obsession with receiving appropriate recognition, build his path for failure.

f) Entrepreneurship as a practice

In France, and looking for financial support, Bain's rival Caselli, move to Paris in 1856.
It was a wise move, for Caselli found Paris a welcoming and supportive environment, what today is called an entrepreneurial ecosystem.

There, he will find networks (social networks and social capital) that he needed to improve his ideas. By 1858 Caselli's work had penetrated Parisian scientific and engineering circles. Caselli met Paul-Gustave Froment, whose workshop produced some of that era's most precise and impressive electrical equipment. Because of that, the French telegraph administration operated the world's first fax service in 1865 with Caselli's pantelegraph.

Day by day operations prove that failures stemmed from misconceptions about the market and technological prematurity. Overly optimistic estimates of demand, and especially the cost and time needed to develop and build machines. In that era, was difficult to find hard data that back up and support the decision-making process.

g) Creativity

Alexander Bain was a self-made man. One of thirteen children became an apprentice to a watchmaker. In January 1830, he walked 19 kilometers to attend a lecture on "the electric fluid." He began experimenting with electricity. In 1837 he went to London and worked as a journeyman clockmaker.

He continued attending public lectures on the latest advances in electrotechnology. In 1838, combining his trade with his curiosity, Bain started experimenting on electric clocks and telegraphs. Bain received patents in 1840 and 1841 for applying electricity to clocks, signals, printing, and railroads. Bain conceived of his "electro-chemical copying telegraph" in early 1842 and received patent 9745 on May 27, 1843.

Imagination was not a problem. The failure to think in economic terms, be charged. Along with technological prematurity. He has creativity, then builds machines and innovate. But there were not enough entrepreneurial competencies in him along with a fail entrepreneurship ecosystem specifically for the fax technology.

An explorative, brief example on Artifact Analysis Worksheet (...continued)
**Analysis based on Coopersmith's (2015), including images. "....continue on next page"

h) Innovation

The technology, the invention was there. But almost everyone had to move to London or Paris, centers of innovation in that era, so they can have access to money, more knowledge, market accessibility, etc. Social capital, and another entrepreneurial culture.

Coopersmith (2015) considers the late era of the fax industry (1908-2000) as a relevant textbook case of demand-driven innovation, where fax machines became commodities. "the innovation continued as faxing became increasingly integrated with computers, creating new markets like fax-on-demand and internet faxing" (Coopersmith, 2015, p. 6).

i) Ecosystem

As time went by, the fax industry began to scale.

By 1850, both Bain and Blackwell machines were competing against an established, expanding telegraph technology. They were not capable to overcome the huge investment and diffusion of the standard telegraph. David vs. Goliath.

Decades later, in the United States, Western Union introduced facsimile as an extension of its existing telegraph system, becoming the world's largest manufacturer and user of facsimile equipment. "By 1939, these circuits handled nearly 300,000 faxes annually (compared to over 139 million regular telegrams) and 1.5 million in 1945, though very few customers designated their messages as faxes. Instead, Western Union faxed regular telegrams at standard rates. A similar service in the Soviet Union faxed more than 100,000 telegrams between Moscow and 17 cities in 1938" (Coopersmith, 2015, p. 66-67).

Make a Drawing, Take a Photograph, or bring the Artifact physically

Fig. 74. — Récepteur du pantélégraphe Caselli.

"The French telegraph administration operated the world's first fax service in 1865 with Caselli's pantelegraph. Louis Figuier, *Les Merveilles de la science*" (Paris: Furne, Jouvet, 1867) (p. 19).

Example of an image by Caselli's equipment, Deutsches Museum, Bildstelle (p. 21).

An explorative, brief example on Artifact Analysis Worksheet (...continued)
**Analysis based on Coopersmith's (2015), including images.

Notes

1   See Almaraz and Montiel (2020), one of the first efforts in the literature to see entrepreneurship from this angle on a country (Mexico).

Author notes

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Last publications:

- Almaraz, A. and Montiel, O. (2020). *The History of Entrepreneurship in Mexico: contextualizing*

theory, theorizing context. United Kingdom: Emerald Publishing.

- Montiel, O. and Soto, A. (2020). Dark side of family business: an exploratory perspective, *Journal of Family Business Management,* (In Press, Oct. 2020)
- Montiel, O. and Soto, A. (2020). An exploratory framework for Entrepreneurship from an evolutionary perspective, *RETOS. Revista de Ciencias de la Administración y Economía, 10*(20), 361-373. https://doi.org/10.17163/ret.n20.2020.10

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Additional information

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