

BUSINESS PROCESS CHANGES ON THE IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE

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ABSTRACT

The digital transformation process is a phenomenon that will affect all organizations. In companies that have already started the digital transformation, Artificial Intelligence (AI) initiatives are begging to appear and will have a competitive impact on organizations leading digital transformation. In businesses that have already started this process, AI solutions have begun to appear. Projects on digital transformation pose new challenges and cause organizational changes in business, operational and administrative processes. Our objective was to identify changes, potential effects, and impacts of AI technologies on business processes, transformation dynamics, organizational structures, and management. This qualitative research examined the cases of five large companies with a high degree of maturity in digital transformation and innovation: one Brazilian company and four multinational subsidiaries based in Brazil. Their industries were telecom & technology, professional services, logistics services, chemical and financial services. Companies have been engaged in a long-term digital transformation and in the AI journey. Different companies have distinct organizational structures for portfolio management and project implementation. Their challenges and changes were identified through content analysis with a semi-structured interview protocol. Publicly available data and data provided by the companies were collected. The main reported challenges were measuring business value, lack of people with

the required capabilities, change management issues, cultural resistance, and integration with existing processes and systems. The most affected business processes included Information Technology & Human Resources services, document analysis, and supplier registration (internal processes), and customer service (external processes). Improving professional and academic work in this field has great relevance at this moment, as professionals and scholars have begun to understand the transformative potential of AI technologies in our society.

1. INTRODUCTION

In recent years, firms in almost all industries have conducted several initiatives to explore new digital technologies and their benefits. Schwab (2017) states that the fourth industrial revolution promotes a staggering “confluence of emerging technology breakthroughs, covering a wide-ranging field such as Artificial Intelligence (AI), robotics, Internet of Things (IoT), autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage and quantum computing to name a few.” Among these new technologies, AI solutions have gained prominence. There are examples of applications in several areas, such as education, logistics, manufacturing, construction, and health care.

The evolution of new technologies—such as mobile and internet-based solutions—, the impact of financial crises along with economic developments, and the changing needs and customers’ behavior have pressured the world economy. These changes have affected countries’ budget deficits, financial services, businesses, and especially the profitability and revenue side of financial tables (Dirican, 2015).

AI has driven changes in business and organizational activities, as well as in their underlying processes and competencies (Van der Meulen, 2018). New technologies oftentimes

have a great potential to create value and are widely recognized as competitive weapons (Porter, 1985; Pisano & Hayes, 1995).

Companies across industries have increasingly relied on AI technologies to automate structured and repetitive work processes, gain insights through extensive analysis of large datasets, and engage in new pathways with customers and employees (Davenport, 2018). The rise of AI presents an opportunity in every industry to differentiate and defend businesses. Nevertheless, implementing a company-wide AI strategy is challenging, especially for legacy enterprises (Ng, 2019).

Integrating and exploiting new digital technologies is one of the biggest challenges that companies currently face. No sector or organization is immune to the effects of digital transformation (DT). The market-changing potential of digital technologies is often wider than products, business processes, sales channels, or supply chains: entire business models have been reshaped and frequently overturned (Downes & Nunes, 2013).

Because of the DT journey and the need to remain competitive in their industries, companies have to understand the changes in their business processes, especially in AI implementations. This awareness is essential to improve our understanding about the potential effects of AI technologies on organizations. Based on our literature review and case studies, we raised the following Research Question (RQ): *What are the main business process changes and impacts of adopting AI solutions?*

A multiple-case study was developed in order to answer this research question. We investigated Brazilian firms with a high DT maturity level that have completed at least one implementation phase of an AI Project. Building organizational AI/machine learning capabilities requires a fundamental reengineering of existing business processes. To be productive and provide

value in a new context, AI, like other forms of Information Technology (IT), requires massive preexisting investment in various other assets, such as technical expertise, businesses processes, data, and culture. AI also requires management to grow with the new capabilities of the organization (Rock, 2020).

This study aims to contribute to the academic literature by improving the understanding about the potential effects of AI technologies on organizations (such as business process management and transformation of dynamics, patterns, and structure of organizations and management). This understanding will highlight the main process changes and issues caused by AI implementation. Moreover, the content analysis of our case studies allows a comparison between different industries in this process to find out similarities and differences. Advancing both practitioner and academic knowledge in these fields is important at this moment, as practitioners and scholars are beginning to understand the transformative potential of AI technologies in our society.

2. METHODOLOGY

A semi-structured interview script for this qualitative research was derived from previous studies presented in the revised literature. The background references that guided the framework were Digital Transformation Strategy (Hess & Matt, 2016; Matt & Hess, 2015); Artificial Intelligence in the innovation process (Kakatkar et al., 2020); Implementation research on Organizational Adoption (Dwivedi et al., 2019) and Case Study Research (Yin, 2017; Eisenhardt, 1989). As a research instrument, an interview script with open questions was designed to conduct interviews and ensure that concepts extracted from the literature were addressed in a standardized manner, allowing multiple cases to contribute to the same theoretical structure (Eisenhardt, 1989).

Based on this literature, we consolidated the main business process changes, impacts, transformation dynamics, organizational structures, and management with AI initiatives. Then we chose five empirical multiple cases from different industries to analyze similarities and differences in AI projects: telecom & technology, professional services, logistics services, chemical and financial services. The companies consisted of four Brazilian subsidiaries of large international corporations and one large Brazilian company.

The companies were selected because they had a high digital transformation maturity level and had completed at least one implementation phase of an AI project. In-depth semi-structured interviews were conducted with managers and leaders of DT, cognitive services, innovation and project & process departments of these companies. Publicly available data and data provided by the companies were collected.

Exploratory research is characterized by having no previous hypothesis to be tested; it aims to clarify concepts and ideas. Exploratory research is indicated when researchers have little knowledge about a real phenomenon and there is little literature on this phenomenon (Eisenhardt & Martin, 2000; Gil, 1999). To conduct these case studies, we adopted Eisenhardt's methodology (Eisenhardt, 1989), where the following steps were performed: structuring the research problem, setting the research objectives, building the conceptual framework, defining the field research protocols, selecting the cases, collecting, analyzing, and discussing data, and drawing conclusions, limitations, further research, and managerial recommendations.

The fieldwork study phase lasted six months, from February to July 2020. We interviewed employees in different positions in enterprises' hierarchy and a consulting firm. Each interview lasted on average 90 minutes. Due to COVID-19 social distancing restrictions, the interviews were performed via videoconference on Zoom, Citrix platform, and Microsoft Teams. The interviews

were recorded for analysis and case writing. After writing, the cases were reviewed by the interviewees in an iterative process. Multiple interview rounds validated the information provided during the interviews. Confidentiality agreements prevented us from disclosing companies' identities. We will refer to the telecom & technology company as TT, to the professional service company as PS, to the logistics services as LS, to the chemical as CH, and to the financial as FI.

3. RESULTS AND DISCUSSION

3.1 Cases overview

Table 1 presents an overview of cases considered in the study.

Table 1. Cases overview

Category	Description	TT	PS	LS	CH	FI
Products & Services	Main areas, products, and services	Mobile and broadband networks	Audit & Assurance, Advisory, Tax and Risk	Postal Service, Express, Global Forwarding, Freight, Supply Chain and e-commerce	Industrial, special and process gases	Banking, investment, private equity, asset mgt, private banking, insurance and retail banking
Main Markets	Business-to-business (B2B) / Business-to-consumer (B2C)	B2B	B2B	B2B and B2C	B2B	B2B and B2C
Size	Global employees	122,000 (2018)	207,000 (2018)	380,000 (2020)	80,000 (2020)	98,000 (2018)
AI Technologies	AI use case technology	RPA, ML, NLP	RPA, ML, OCR, NN	RPA, ML, IoT, Robotics	RPA	RPA, ML, NLP, NN, DL

Business process changes	Main scope process impacted	Customer service	Internal process	Internal process	Internal process	Customer service
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Source: Authors

3.2 Cases discussion

The DT journey is a relatively recent movement in companies. Despite the high maturity degree of our sample companies in DT and innovation, the first projects started in 2016 (TT) and the last ones in 2019 (CH). DT is at the basis of all business strategies and plans; it plays an essential role in the business roadmap of internal or external initiatives.

All companies in the case study were related to an open innovation ecosystem either with partners or with innovation hubs. They created their own spaces for start-ups or their own acceleration programs. All cases with AI solutions implemented had partnership with third parties, such as consulting firms and startups with a varied scope (PMO, development, support, tools, and training) and big tech companies for the cognitive solutions, such as Microsoft, IBM, and Amazon.

In 2018, PS started a partnership with an innovation hub, which is an open innovation platform that connects more than 12,000 start-ups of different maturities in the development of non-traditional solutions for any type of problem.

In the same year, CH partnered with an innovation platform with hubs in Germany, the United States, and Singapore. This platform connects over 30 start-ups and is hosted by partners from the industry and from the research and scientific.

The companies had an extensive variety of projects relating to DT/AI in their roadmaps. As presented in the selection criteria, these companies were highly mature in DT and were present in various industry segments.

Apart from CH, all the other companies presented virtual assistant solutions for both internal and external relationships. Bailey et al. (2020) confirmed this trend by presenting the employee experience and customer experience market movement with chatbots.

Internal cognitive assistants for employees are used specially for IT and HR themes. These assistants answer questions, present information, and locate documents and procedures. For example, in PS, there are projects to automate parts of administrative processes, such as scheduling vacations and scheduling professionals in project engagements. Bailey et al. (2020) calls this AI solution as enterprise digital assistants (EDAs). This groundbreaking tool has emerged to transform the way business professionals work. EDAs are effective applications that act as an interface with other systems to aid in human augmentation and automation of tasks and processes.

External cognitive assistants are used by customers to obtain information about the products and services they use, create and track a claim, contract services, perform operational tasks, etc. This list is aligned with the Vanson Bourne (2019) survey's findings about this technology: improving customer self-service, resolving customer issues faster, automating responses to customer complaints/queries, helping customers navigate around the company's website, predicting customer behavior, using chatbots to interact with customers, gathering contextual insight before routing customers to the best resource and/or content, and mining for sales leads/opportunities. This trend is also verified in the Juniper Research (2018), which highlighted the increasing use of AI in the form of chatbots for customer service applications. These deployments may realize annual savings of \$ 439 million globally by 2023.

FI's cognitive virtual assistant solution offers the largest product portfolio (90 products) and has the functionality of understanding customers' natural language in their native language (Portuguese, in this case).

PS's auditing function uses an AI cognitive solution to read documents and prepare audit working papers (WP). Previously, the teams received the reports for auditing, the teams personally read the documents and searched for relevant topics. In the new AI-driven process, after receiving the documents, the audit team uploads the document to the cognitive platform, which "reads" the document, searches for relevant topics, and prepares the abstract in a WP automatic template. In the Advisory department, AI was applied in a Cognitive Contract Reader using IBM Watson technology.

Business process changes in both PS and CH improved the productivity of internal teams. PS optimized the cognitive documents' reader for auditing services, which is also used in projects for Advisory, Risk, and Tax clients. CH digitized a process in the fiscal department and the new supplier's registration using RPA solutions; these activities reached at least 80% automation for the fiscal solution and the entire registration process, except for the final approval, which remains a manual process.

In customer contact terms, an omnichannel trend was observed. TT and FI offer the largest range of channels to connect with customers in multiple platforms, such as app, WhatsApp, website, Facebook Messenger, Google Assistant, and Alexa. There is an increasing trend in the omnichannel strategy, including various digital channels for sales and marketing, as presented in Hansen & Kien (2015) and for retail, as reported by El Sawy et al. (2016) in the case of marketing moves launched by the LEGO group.

In this study, the AI solutions implemented affected business process in both internal and external relationships. In TT and FI, the main impacts were on the external relationship (customer services). In PS, LS, and CH, the main impact was on the internal relationship (employee assistance).

Companies with cognitive solutions for customer services reduced the waiting time and interaction in the costliest channels, such as call centers. In addition, this solution is available in several digital channels and domestic assistants (e.g., Google Assistant and Alexa), which expands the interaction and relationship with customers.

About AI case technologies, Robotic Process Automation (*RPA*) was observed in all case studies. Natural Language Processing (*NLP*) was observed on the Telecom & Tech, Professional and Financial. Machine learning (*ML*) was observed in all case studies except the Chemical company. Neural networks (*NN*) were observed on Professional Services and Financial. Optical Character Recognition (*OCR*) in the PS company and Internet of Things (*IoT*) and Robotics in the LS company.

For the FI case, the business process impacts in the company started the implementation for internal process (employee relationship and training propose) and then moved to external process (customers relationship), representing a new channel for services and transaction operations.

TT has the largest reported number of digital employees, with more than 800, followed by LS, with 350 robots. TT reported a financial benefit since the beginning of the AI implementation (R\$ 100 million). Furthermore, its automatic solution retained more than 20% of defect tickets.

In all cases, the increase in productivity was a benefit. In the redesigned processes, the automation of activities reached at least 80%, and for the tax solution of the chemical company, the entire process was automated except for the final approval that remains manual.

From the point of view of organizational aspects in AI/DT projects, the companies presented different organizational models according to their structures. However, companies' IT

departments have always been involved in digital projects. PS and ST have specific organizational structures: Innovation & Investment and Digital Committee, respectively.

Another common point between companies' cases was areas that have similar digital functions, such as the Digital Transformation, Digital & Analytics, and Digital departments. These areas are responsible for the assessment, process mapping, design, process redesign, development, and implementation of DT/AI solutions. In the cases, these areas cross-collaborated with the business area mainly in the initial project phases to assess and map business processes in the current state.

Considering the structuring of new areas, TT created a Bot Training Center (*BTC*). *BTC* was created to analyze whether the cognitive solution correctly understands customers' queries. FI created an Artificial Intelligence Center (*CIA*), a team of employees specialized in the content and verification of answer accuracy. PS created an Audit Innovation Technology and a Data & Analytics department and a virtual assistant curator to increase and train its AI solution.

Concerning workforce, TT and FI laid off employees, but PS, LS, and CH did not. CH made an effort to upskill and reskill its former professionals on the process that was changed by automation. CH implemented this training with the collaboration of third parties, such as consulting firms and start-ups with varied scopes.

The main challenge reported on AI implementation was measuring the business value in a way that validates project results—for instance, the direct earnings from the AI project, regardless of market conditions. Other challenges included lack of people with the required digital capabilities and agile and knowledge skills, change management issues, and cultural resistance.

4. CONCLUSION

In the case studies, business process changes occurred in the areas where AI solutions were implemented. Also, companies' roadmaps presented projects to perform DT/Digitalization/Digitization and AI. Some implementations started internally, in the employee relationship; later, they evolved to the external relationship (customer), as in the case of PS with its the cognitive assistant and cognitive document reader.

We detected a decrease in manual activities performed by humans. This reduction was possible with the replacement of the action agent, which started to be robots.

Business processes changed in several departments and areas with the AI implementation. Building organizational AI/machine learning capabilities requires a fundamental reengineering of existing business processes and competencies (Rock,2020). Process automation was described by Davenport (2018). The companies studied were connected with open innovation environments, either collaborating with partners in innovation hubs, or creating their own spaces for start-ups or their own acceleration programs.

As for business impacts, we observed process automation with a much higher level of automated tasks in the redesigned process (for both cognitive solutions and RPA), an increase in productivity, an increase in the service level, a decrease in human interactions, the opening of new multiple channels to interact with customers (omnichannel trend), financial benefits, and a supported company growth without increasing the organizational structure.

We observed the creation of new organizational structures and job roles—like virtual assistant curator—, layoffs, upskilling, reskilling, and employee reallocation to other functions. The new organizational structures and job roles appeared in the case of solutions related to digital technologies development, digital training skills, and executive committees. These changes were consistent with the idea that agility and ambidexterity are necessary capabilities to compete in a

digital world.

Another relevant topic was the impact of the COVID-19 pandemic on the Digital Transformation/Industry 4.0 transition. A trend towards accelerating digitization and AI initiatives was observed to meet new customer demands and behaviors.

The main challenges of AI implementation were measuring the business value, the lack of people with the required capabilities, change management issues, cultural resistance, and integration with existing processes and systems. These challenges are found in DT/AI implementations in the literature (Dwivedi et al, 2019).

This study's limitations include the limited number of cases and interviews in each company, the lack of quantitative data and business process updates, disclosure restrictions on internal databases, scorecards, KPIs, and managerial reports, case studies in other industries, and the need for a deeper understanding in the AI portfolio selection.

Further research should overcome these weaknesses as well as deepen the discussion with cases in other industries and geographies. Another future research stream can investigate how similar contexts contribute to the understanding of business process changes and dialogue with the findings of this exploratory study. Further studies can also analyze different AI project implementation approaches in the literature and their deeper impacts on workforce. Some questions that deserve more exploration include: *(a) What are key success factors, and do they differ with the use of AI technology? (b) Which AI technologies can mostly benefit each business processes and why? (c) How to measure the business value of AI in the business processes? (d) How can AI technologies enable new capabilities and lead to a truly integrated company? (e) What is the level of dependence on third party suppliers and providers for AI projects?*

As an outcome of this research, we permit ourselves to give some advice and

recommendations to the practice of business process changes in AI project implementation. For example, before setting up an AI project, a phase of process mapping (*As-Is*) and process redesign (*To-Be*) is recommended to clarify which activities will be transferred to the cognitive solution and at which depth. The IT process infrastructure and architecture mapping should be performed as well to decrease integration challenges. In order to reduce cultural barriers and team resistance, teams should be involved in the project since the initial phases. Technical and business teams should be integrated because greater harmony is expected in multifunctional teams. Although these are currently “AI hype” subjects, it is important to provide formal training sessions on AI solutions and on agile project management methods. Starting with an AI solution internally increases the company’s value in practice; it can evolve to external relationships with the help of third-party suppliers.

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