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Commercialization of digitally-enabled products and services: overcoming the barriers by applying action learning

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Abstract. This paper describes and analyses the application of Demings PDCA circle in combination with action learning methods to support the commercialization of digitally-enabled products and services. It does this through a single use case where one of the authors was embedded. The paper considers the challenges for a traditional firm selling solutions based on digital technology and how this is then converted into a value proposition. PDCA provided a change management framework that supported the action learning that was taking place by providing iterations with reflection phases. This allowed the firm to proactively identify the barriers that it had to overcome and then to understand how it overcame these barriers. In doing so, it built new knowledge within the firm that could be standardized. This is an initial study, and additional studies should be made of alternative cases to allow for a deeper comparison.

Keywords: commercialization; digitally-enabled; PSS; PDCA; action learning.

1 Introduction

The motivation for this paper is to understand how a German capital equipment manufacturer used its performance improvement process to help to commercialize its digital solutions. Commercializing digital solutions within a Product-Service System (PSS) context has been challenging for many firms [1]. Traditional firms often find selling digital-enabled solutions challenging, not realizing that in many cases, “digital products” are in fact “services” [2]. They also miss the interplay between digitally enabled and traditional offerings [3]. The digitally-enabled solutions force an adaption to the firm's underpinning business model and lead to challenges internally with the delivery of digitally-enabled solutions and externally in terms of the sales processes.

This study follows a German-based manufacturing firm that designs and manufactures equipment for drive lines in commercial vehicles, rail applications, and marine propulsion. The digital business developed a solution to monitor bus performance. The firm applied its PDCA (Plan-Do-Check-Act) improvement process to overcome the barriers to commercialization with the new digitally-enabled value proposition. Based on this, the research question for this paper is: *“How did the PDCA process help the management to overcome the barriers to the successful commercialization of the new digital solution?”*

2 Literature review

The literature review focuses on the three aspects that were considered important from the research question, namely the challenges of the commercialization of “digital solutions”, understanding the value proposition being solid, and the PDCA of Deming process approach [4] process used in operations management to improve performance.

2.1 Challenges for traditional manufacturing firms of selling digital offerings

The integration of digital solutions into the market offering affects the business model [3] and its configuration. This is because the addition of digital solutions enables the creation of new value propositions, transforming the product by means of the servitization process [3]. Transforming a traditional manufacturing firm to one that sells digital offerings based on Industry 4.0 technologies is not without its challenges [5]. As confirmed by Pasupuleti & Adusumalli [6] challenges concern both traditional manufacturing and high technology-based firms and also apply to SMEs [7]. In this regard, the taxonomy of barriers [8] provides a set of dimensions with questions to understand the challenges that a specific firm faces when making the transition to digitally-enabled solutions from more traditional offerings. This can be translated into a solution (or value proposition) that customers are willing to buy. The integration of digital solutions into the firm’s offerings also affects the business model [3]. Adopting a lean approach has been recognized in the literature as an effective way firms can overcome barriers that slow or prevent the commercialization of new business opportunities [9]. Based on the idea of action learning, lean management promotes the innovation process through the diffusion of knowledge fostered by information sharing and people commitment [10].

2.2 Understanding value and the value proposition

The literature describes the importance of understanding what customers value in B2B environments and confirms that customers do not buy “features” but generally purchase a solution that delivers a value proposition that supports the purchaser’s value creation process [11]. This confirms the need to describe the points of difference between alternative solutions, not by comparing features but rather by estimating the value creation potential.

By leveraging the experience of early adopters, new technologies can be used to help firms develop alternative value propositions [12]. This requires linking the (digital) strategy to the value proposition and then to its commercialization [13]. Nussipova [14] describes the challenges in adapting the existing value propositions with new digital technologies to enhance the value creation process.

2.3 Improving performance in a firm

The use of lean principles has been used in many manufacturing firms to improve operational performance. Among others, A3 sheets are adopted to help describe a problem and its root cause, prior to taking any corrective action [15]. A3 sheets force analysis of the problem step by step and avoid jumping to a solution. The approach taken follows the PDCA cycle, [16] based on Deming:

- i. Plan – identify and analyze the problem;
- ii. Do – develop solutions, implement the solutions;
- iii. Check – evaluate the results to identify if the desired goal was achieved;
- iv. Act – standardize the solution.

The benefit of using the PDCA cycle lies in the creation of an environment for continuous learning [17] based on a structured standardized approach [18]. The result is a marked improvement of the firm's long-term performance [19]. A PDCA cycle can be used in any improvement project based on lean thinking principles, including the development, design and delivery of digital solutions [20].

3 Methodology

A single case study was considered appropriate to answer the research question of this study [21]. The action research during the execution of the change management process was based on the PDCA approach [17]. One of the authors was embedded within the case, and an action research approach was used [22], to limit the observational bias that is a risk of embedded qualitative research [23].

The approach taken is (PDCA circle with elements of action learning) in this study is described in Fig. 1. Each of the action research phases is based around the four stages of the PDCA improvement process. Each of these was assessed in terms of the planning (or inputs), the action (or transformation) and the results (or outputs) achieved. The assessment of the reflections from each phase was described by the embedded researcher, evidence was shared with the other authors and jointly reviewed to reduce researcher bias. The final phase of the methodology was a reflection of the whole change management process. As with action research the four phases can be further analyzed down as [24]:

- i. Planning (or input);
- ii. Action (or transformation);
- iii. Results (or outputs);

- iv. Reflection (or feedback).

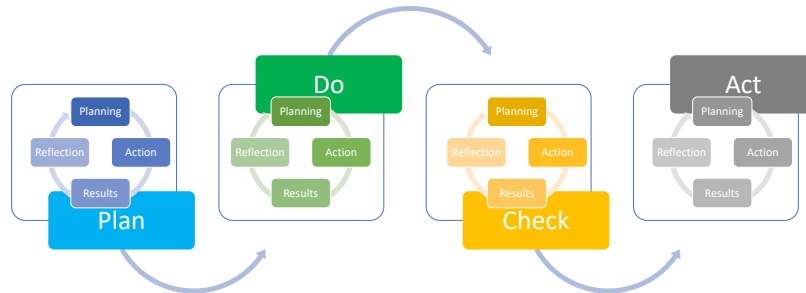


Fig. 1. Action research methodology that supported the analysis of the PDCA improvement processes applied in the case

4 Results

The case is based on the products of a start-up company integrated into a firm, as it is the main shareholder. The start-up company has developed a data transfer solution with a gateway for public transport in buses and a fuel economy software solution using the gateway plus an information screen for drivers. By taking a major share of the start-up company, the firm was willing to support global sales and marketing with resources and structures from its existing setup. The firm has a global and local presence in all relevant markets for public transport in the sectors of rail, buses, and ferries. The start-up company has 25 employees – mostly in development areas and only 1.5 sales employees. The start-up has only 5 customers in the Nordic region. Two big contracts have been lost due to bad performance. The main task of the sales initiative was to put the startup company's business on a larger foundation with more customers.

4.1 Plan

In the “Plan” phase a study and workshops with the existing board and sales forces of the startup were executed. Added to this are customer interviews offering insights into the business model and the product base. Different organization models for additional sales resources have been evaluated. The chosen model – to use existing salespeople – who know the bus market – as multipliers in their regions for the new product was worked out in detail, including face-to-face training. In Table 1 the Plan phase scores are shown with the main results.

Table 1. Action research main outcomes: Plan phase

Step	Findings
Input / planning	<ul style="list-style-type: none"> — Salesforce available — Market know-how is present — Motivation for selling a new product must be created
Transformation / action	<ul style="list-style-type: none"> — Giving a defined team a sales task — Create a training plan — Run a workshop to define blocking points – based on first sales experience
Output / results	<ul style="list-style-type: none"> — Understanding the blocking points — Definition for added value is needed — Training of the multipliers
Reflections	<ul style="list-style-type: none"> — Motivation of the team was positive – a clear willingness to provide something “new” — Sizing of the selected team sounds right — Understanding the value of the offering was the biggest challenge

4.2 Do

The “Do” phase was dominated by an intense training workshop at the startup’s premises, followed by customer interviews in a limited promotional tour for the data transmission and fuel economy solution. The criteria for the first customer meetings were an existing business relationship and good personal relationships with members of the customers’ organization as shown in Table 2.

Table 2. Action research main outcomes: Do phase

Step	Findings
Input / planning	<ul style="list-style-type: none"> — Planning of a training session — Starting with different skill levels — Ensure the general motivation level is high and stays at the high level
Transformation / action	<ul style="list-style-type: none"> — Execute the training in theory — Additionally, to show use-cases from different markets — Share experience with salespeople who already sold the digital products successfully
Output / results	<ul style="list-style-type: none"> — Trained sales staff — Availability to answer a customer’s initial questions — Knowing when to integrate the technical experts into a customer discussion
Reflections	<ul style="list-style-type: none"> — Training sessions should be very detailed – adapted to different skill and experience levels of the participants — Real use cases are help create confidence — Sales force needs to be able to answer – on a professional level – at least the first 3 detailed questions of a potential customer

4.3 Check

The main results during the “Do” phase have been revised in the “Check” phase. The team arranged bi-weekly online meetings to share experience and identify potential blocks to sales. Business market management is the process of understanding, creating, and delivering value to targeted business markets and customers [11]. The value description of the data transfer is lacking, though the value for the fuel economy solution has been clear and obvious.

Table 3. Action research main outcomes: Check phase

Step	Findings
Input / planning	<ul style="list-style-type: none"> — Slow sales success — Customers do not show serious interest in the products — Added value of the products is not clear
Transformation / action	<ul style="list-style-type: none"> — The product management of the startup will define added values — Sharpen the market needs – as an input from the sales teams — Have an intense discussion – learn where the value is (hidden)
Output / results	<ul style="list-style-type: none"> — Data has no value – unless they lead to an information level helping customer’s business case — USPs to be defined — Positive input needed on cost, cash, safety or “go-green” on customer side
Reflections	<ul style="list-style-type: none"> — Even after first successes, clear product values are needed — Added values must be presented to the sales force — Marketing material must focus on customer benefits

4.4 Act

The “Act” phase concentrated on both products – knowing that the added value for a customer with the fuel economy solution was always transferred first in the sales process. The possibilities for data transfer and looking for customer specific needs were added later. Table 4 shows the general findings of the act phase.

5 Discussion

Returning to the research question of this paper, the PDCA approach was familiar to the staff within the firm. However, the authors confirm that it was generally applied within the production environment rather than in commercial or sales related fields. PDCA is an action learning approach to problem solving [19], and the commercialization of digital offerings is one such example of problem solving. The firm did not apply the Lean Startup approach, which is closely related to PDCA and again is an action learning tool, as it was not an approach that was known within the firm and the main result – quick prototyping – does not apply for this case. Nevertheless, PDCA provided a known framework to structure the commercialization of the offering and to overcome the barriers to change. In other cases, the application of Lean Start-up may have been

considered, yet here the management would have only focused on two, or at maximum three of the blocks, and so it is hypothesized that PDCA provided a sufficient framework to allow the sales team to overcome the barriers they were facing.

Next to Lean Start up the firm applied action learning approach of Deming (i.e., PCDA). Action learning shows its greatest strength in learning and adapting new processes and way of acting, where in the case of overcoming the barriers, a wider range had to be considered. Action research follows a guided structure as the PDCA circle as well and it was found to combine the action research tools into the phases of Demings PDCA logic.

Table 4. Action research main outcomes: Act phase

Step	Findings
Input / planning	<ul style="list-style-type: none"> — Plan to run sales activities in different countries — Create a structured plan on customer view — Prepare sales and marketing material
Transformation / action	<ul style="list-style-type: none"> — Organize and execute customer visits or calls — Combine – if necessary – a technical specialist with an experienced salesperson — Share the experience on the sales journey in bi-weekly calls with a clear leadership
Output / results	<ul style="list-style-type: none"> — Provide - during the common calls - decisions to reach the next level in the sales process — Find the right product for entering each customer discussion — Celebrate sales successes
Reflections	<ul style="list-style-type: none"> — A sales execution plan is the base for a successful market roll-out — Regular reviews to share experience within the team are essential — Highlighting even small successes supports motivation

The “Plan” phase allowed the team to identify the barriers that they needed to overcome and to identify the tools that they needed (or thought they might need). The barriers have been: (i) mental barriers to sell an unknown product, (ii) missing added value proposition to the customers, (iii) market barriers, as the products have not been promoted in a bigger area, (iv) financial barriers as missing customer values meant market-driven pricing was not installed or available, (v) barriers on the product because it was not developed for a global or defined market, (vi) know how and information barriers hindered a quick global roll-out and entering new markets. This led to the need to motivate the (sales) team and to develop the desire/motivation to offer something new. This was important, as change requires the team to identify the barriers that exist and then be able to overcome them [8]. This requires change in the mindset of the sales team and the ability to demonstrate value to the potential buyer of their new offer [11]. The “Plan” phase of PDCA is based on the understanding that planning can only support the “Do” phase and that the plan must be adaptable to overcome unforeseen challenges 5).

The “Do” phase was supported by the development of the sales training to change to a consultative selling approach [11]. Not all sales managers could do this without first being trained. Part of this needed a move to using real cases to help describe where

value could (and would) be created with the new offering, often using example cases. This also provides the opportunity to understand the customer's problems and needs from their perspectives [10].

The "Check" phase allowed the adaptation of the process, this was necessary as even after the initial successes, updates were needed, based on the findings, as not everything followed the plan as expected. For example, even after training the sales managers could not describe the solutions fully and some fell back to pushing the features rather than focusing on the value creation and points of difference [11].

The final "Act" phase within PDCA provides a mechanism to standardize the approach. Based on the reflections from the prior phases a sales execution plan for the wider rollout was developed, including support with consultative value-based selling. As part of the process, it was found that the sales managers need regular reviews to share their experience of selling. This was necessary even for experienced sales managers.

The main barriers in the commercialization of digitally-enabled products and services have been identified as: missing an experienced and trained team, dealing with a product missing value adds for the customers and a non-existing sales organization and leadership with targets and timelines. These barriers were successfully solved especially with the findings in the act phase.

5.1 Managerial relevance

The PDCA approach from Lean can be used to support action learning in the development of a sales approach for digital-enabled services. Often the approach is used within a production environment, yet there is evidence here that it supports the changes needed to develop a sales approach. Having a look into the lean Sensei philosophy, which describes a management system and mindset, Ballé et al. [25] find there as well the base of lean and PDCA. There is some evidence that supports the application of PDCA as a change management tool and this is in line with Pietrzak & Paliszkiwicz [17]. The basis was the marketing approach of Anderson, & Narus [11].

5.2 Academic implications

PDCA is a form of action learning [20], that helped the firm to identify and overcome the barriers for selling digitally enabled services. Typically, it is generally confined to the production environment [15], yet in this example it has been used to guide the change management process for the commercialization of digital offerings within a manufacturing firm. The firm did not consider Lean Start-up as an approach, because the main positive effect of this method is rapid prototyping and the dominating question for this firm has been the analysis and the structured review. The PDCA method leads to a structured way of thinking and developing that is understood and followed by all the people and organizations involved.

6 Conclusions and future research

PDCA provided a structured framework, with reflection, that supported the development of the commercialization of the digitally-enabled solutions. The use of the action learning approach was supportive and made the team consider the actual barriers that they faced with this change. It provided the structure to allow the team to overcome emerging barriers that were not initially anticipated, it also provided the team with an approach to embed the lessons learned into the standard business processes.

This is an initial study and further analysis is needed around the categorization of the barriers identified and actions to overcome them. Also, the link with Lean Start-up approaches could be further examined.

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