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Exploring Alternative Revenue Models for Construction Consulting Firms in the Digital Era

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Abstract: The AEC industry, including construction consulting, is experiencing digitalization through technologies like Building Information Modeling (BIM), impacting firms' business models. The traditional hourly-based model does not align with shortened project timelines driven by digitalization, design automation, and product-based approaches. This study uses a case study approach and explores and evaluates four selected alternative revenue models (freemium, subscription, out-come-based, and performance-based) for value creation using a digital tool developed by the consulting firm. The freemium model enhances market reach but requires a high conversion rate. The subscription model offers steady recurring revenue and supports client relationships. Out-come-based and performance-based models link payments to client outcomes and performance metrics, fostering efficiency and competitive advantages. The study identified multiple target markets for this tool and emphasized the importance of a portfolio revenue model to meet specific client needs in the digital era. Implementing alternative revenue models aids return on investments and avoids the digitalization paradox. Construction consulting firms must adeptly manage these models' complexities to address diverse client needs and leverage digital transformation opportunities.

Keywords: construction consulting industry; alternative revenue models; product-based approach; digitalization; business model; AEC industry

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1. Introduction

The AEC (Architecture Engineering and Construction) industry is a significant part of the global economy and is changing digitally, driven by technologies like Building Information Modelling (BIM) [1] or blockchain technology [2] that can be utilized to promote disruptive innovation [3]. Design automation, Building Information Modeling (BIM), and generative design enhance sustainability in the construction industry by optimizing energy efficiency, improving design accuracy, and supporting environmentally conscious building practices [4,5]. On the other hand, studies such as BIM-based sustainable structural design [6], the relationship between sustainability and digitalization in AEC [7], and the application of digitalization for sustainability assessment [8] highlight the importance of digitalization in the AEC industry for sustainability.

Automation is critical in enhancing efficiency within the construction industry, particularly when integrated with digital tools such as Building Information Modeling (BIM) and generative design. These tools facilitate tasks like design automation and project management, leading to improved accuracy, reduced project timelines, and optimized resource utilization. For instance, the role of automation in optimizing construction processes can be further illustrated by the work of Ghasemi et al. on crane location optimization in pre-fabricated construction sites, demonstrating how automation can enhance project efficiency through the strategic positioning of resources [9]. This example aligns with

the trend of integrating digital tools into construction to streamline operations and drive sustainable outcomes.

The AEC industry has many consulting firms that invest in BIM and other digitalization techniques that can assist with time-consuming activities, such as document management [10]. Parametric or generative design leads to design automation [11] and, consequently, shorter design time, which does not align with the current revenue model and how most construction consultants are paid today, i.e., by the hour. Parametric and generative design shift firms away from project-based work, and automation lets consultants create the same value in fewer hours. Thus, focusing on the construction consultants' business model is necessary.

Approaching challenges AEC firms face from a business model perspective has been shown to effectively address issues such as client dissatisfaction and slow digitalization [12]. There have been studies on business models within the industry [13]. However, the literature on construction consultants is scarce, but if we widen the scope to the AEC industry, there is some literature on business models and their elements, such as revenue models. Plevris et al. [14] argue that innovative business models are needed to leverage emerging technologies effectively in the AEC industry because traditional models may be inadequate for exploiting the full potential of this emerging technology. Cao et al. [15] and Srećković et al. [16] agree on that, saying that the AEC industry's digitalization and transformation necessitate the consideration of new business models. Digitalization creates new revenue streams and value-creation opportunities [17]. On the other hand, the business model outlines a firm's value offering and feasible revenue and cost structure [18].

According to Teece [19], the elements of a business model are value creation, delivery, and capture. Revenue models can be investigated based on their association with capturing value [20]. However, Osterwalder [21] considers the revenue model a separate business model element. Ensuring consistency between the various elements of a business model is essential to attain optimal performance [17]. According to Şimşek et al. [22], designing a new business model requires changes to the existing value-capturing structure to ensure profitability through "solid revenue streams, efficient cost structures, and winning profit formulas". The profit formula refers to the revenue model. Regarding value capture, different revenue models can be mentioned, such as freemium [21,23,24].

According to the strategic template Business Model Canvas, cost structure and revenue stream are two business model elements that fall under the financial category [25]. Thus, the financial aspect of business models includes revenue model and cost structure [26]. Financial value is one of the significant elements in the innovation of a business model that focuses on "how to capture value through revenue streams and changing the price-setting mechanisms" [27]. However, having an innovative pricing mechanism and revenue drives the success of business model innovation [28]. The short-term profit-making approach in the construction industry business model should be changed [29] to a long-term connection [30] with repeating client payments [21], such as the subscription revenue model.

When applying digital technologies, it is crucial to evaluate their business value [31]; however, few studies consider the business value of firms' developed digital tools. Having a digital business model by financing digitalization without comprehending consequences cannot guarantee profitability and may decrease it, which is called the Digitalization Paradox [32]. One element that should be examined for emerging innovative business models is the financial value, which includes revenue streams [27] as a monetizing platform [33]. Those examinations are missing for digital tools that construction consulting firms have developed to be more product-based. Accordingly, it is vital to avoid digitalization traps, including a lack of comprehension of the revenue model, to prevent failure in the digital business model [32]. It emphasizes the importance of the revenue model, as another term for the revenue model, when it comes to digitalization to avoid the digitalization paradox.

On the other hand, the product-based approach is a market trend [34] enabled by digitalization. The AEC industry could be industrialized and market-based instead of project-based, enabling valuable opportunities [35]. For instance, digitalization shortened

design iteration time and eliminated unnecessary data re-entering processes [36]. Construction consulting firms use an hourly revenue model [37], which has not changed because the time spent by designers is thought to match the value created [38]. However, there is a lack of studies on alternative revenue models for moving from an hourly-based, project-oriented approach, which relies on the designer's time, to a product-based model enabled by digitalization that shortens design time.

The prevailing revenue model remains the traditional hourly-based revenue model in the construction consulting industry. Despite advancements in digitalization and the shift toward product-based approaches, as market trends, many firms, including the case firm in this study, continue to rely on this model. This widespread use of the hourly-based revenue model is not limited to the case firm but is an industry-wide practice that extends to its competitors. The unwillingness to move beyond the hourly-based model presents a challenge to leveraging the full potential of digitalization. Moreover, there is a notable lack of empirical studies examining alternative revenue models in the construction consulting context, further limiting industry innovation. It highlights the need for research focusing on exploring alternative revenue models that align with upcoming digital tools.

On the other hand, some construction consulting firms have developed their own digital tools to be more product-based, which does not align with the hourly-based revenue model. As a result, they need to consider alternative revenue models to a new business model. However, there is a lack of studies comparing potential revenue models [20], and firms need to explore, select, and assess alternative revenue models, especially for digital investments to being product-based by construction consultants. This study presents the following aim and research question to address these issues.

Aim: To identify, select, and evaluate alternative revenue models for construction consulting firms that develop digital tools that are more product-based, as substitutes or additions to the current hourly-based revenue model, considering potential target markets. It will be the initial step in establishing a framework for selecting and assessing alternative revenue models.

RQ:

1. What alternative revenue models can the construction consulting firm select when transitioning to a digital product-based approach, considering the tool's specific features and potential target markets?
2. What are the considerations, advantages, and challenges of implementing alternative revenue models for construction consulting firms' digital tools?

This study looks at alternative revenue models for construction consulting firms that have developed product-based digital tools. It includes a digital tool developed by a Swedish branch of an international construction consulting firm, which automates the design and analysis of reinforced concrete slab foundations. The study uses a mixed-methods approach, including a literature review, case study, and SWOT analysis. Additionally, focus group discussions were conducted to evaluate four revenue models: freemium, subscription, outcome-based, and performance-based.

The study revealed that each alternative revenue model has unique benefits and challenges. The freemium model can expand market reach and increase brand visibility, but it needs a high conversion rate to be financially sustainable. The subscription model provides predictable, recurring revenue and is well-suited for long-term client relationships. Outcome-based and performance-based models tie payments to client outcomes and performance metrics, promoting efficiency and competitive advantages, but they require substantial support and development frameworks. The study identified multiple target markets and highlighted the importance of implementing a portfolio of revenue models tailored to specific tools, considering client needs.

The findings offer a framework to help select and evaluate alternative revenue models for capturing value from product-based digital tools in construction consulting. It emphasizes the limitations of current hourly-based revenue models in the context of digitalization and the shift toward product-based approaches. The study suggests remedies that align

revenue generation with digitalization or value creation. Additionally, it addresses the digitalization paradox and contributes to the broader discourse on business model innovation in the AEC industry.

This paper introduces digitalization challenges in the AEC industry and the need for innovative business models and alternative revenue models. It reviews the existing literature on revenue models. The methodology section describes the mixed-methods approach, including case studies, literature reviews, and focus group discussions. The findings include a SWOT analysis of selected revenue models and a discussion of their potential applications.

2. Literature Review: Revenue Models

Considering the relationship between business model and profitability [39], one of the business model elements is the revenue model [33]; however, revenue models such as subscription, freemium, and outcome-based are mentioned interchangeably as a business model [24,40]. Businesses employ phrases like revenue models or earning logic to describe how they generate income [41]. Revenue is the total income generated from the sale of a product or service, which is calculated by multiplying the price of the product or service by the number of units sold [42]. On the other hand, profit is the amount of money that remains after deducting all expenses from the revenue earned [42]. The revenue model gauges a firm's capacity to generate revenue from the values provided to the clients [33].

As per Osterwalder's research [26], the revenue model is referred to by different names in various literature as a business model element. This element of business models has been defined in multiple ways [43]. Some of the commonly used terms are revenue model [44,45], revenue stream [46], source of revenue [47], value exchange [48], pricing and revenue source [49], pricing model and revenue model [50], pricing structure [51], how to make money in this business [52], and benefits to the firm and business model [53]. Although this paper's references use different revenue terms, we decided to utilize one term: revenue model.

To define it, revenue in the AEC industry refers to "the cash a company generates from each customer segment" [54]. On the other hand, innovation is challenging for the AEC industry due to its narrow profit margins, decreasing revenue, and limited financial flexibility [55]. In other industries, digital business models such as cloud-based platforms and web-based businesses have had to diversify and reevaluate their revenue models due to technological and societal changes affecting their business model [56,57]. BIM-based cloud computing is another option explored in the AEC industry [58]. On the other hand, according to Ojala [41], software-as-a-service can be a proper revenue model for cloud computing, including pay-per-use, software rental, or software licensing revenue streams. However, Remané et al. [59] put forward a monetization mechanism regarding utilizing digital technologies that are classified according to various business model elements; they presented several ways of capturing value, including continuous subscription, after-sales fees, customized pricing, commercialization of data and information, usage-based pricing, and fees for data intermediation services.

Digitalization leads to a more varied revenue portfolio, including recurring income from digital services and subscriptions [60]. Moreover, other alternatives should be investigated, including profit sharing [61]. At the same time, pricing mechanisms, which include fixed prices [62], should be considered.

The revenue stream can be generated through "asset sale; usage fee; subscription fee; lending, leasing, renting; licensing; brokerage fees; and advertising", which can be classified as repeating or non-continuous client payments [21]. However, there are some other revenue streams, including performance-based [63], outcome-based [64], and freemium [65]. Firms can utilize various revenue streams with different pricing models to form their revenue models for distinct target markets [33], as a multi-revenue stream is common for startups [19].

According to Osterwalder et al. [21], the revenue models, including Asset sale, Usage fee, Brokerage fee, Renting, lending, and leasing, are defined as follows: Asset sale is a revenue model in which tangible assets are sold; Usage fee is a revenue model where clients expend to the services or products they utilize, based on the units they consume; Brokerage fee involves charging intermediary fees for facilitating services rendered between multiple actors, such as property dealers; Lending, renting, or leasing allows the complete utilization of an asset for a specific time and expense and generates regular and systematic revenue for the service provider while reducing the client's cost. Next, several different revenue models are presented.

2.1. Advertising

The advertising revenue model generates revenue through advertisements [21]. In this model, to attract advertisers and generate revenue, firms can develop products or services and use the availability of potential clients [66]. Two pricing models are available for this revenue model: cost-per-click and cost-per-action [67]. It is possible to combine distinct revenue models, such as advertising and pay-per-use [68].

2.2. Revenue Sharing

The revenue sharing model defines the allocation of gain and pain [69] and is used when a service provider is paid a "wholesale price per unit plus a percentage" of the client's income, who is not the end consumer [70]. Another type of revenue-sharing model involves no wholesale price and encourages parties to innovate efficiently [69].

2.3. Licensing

The licensing model is a revenue model that grants utilization rights of intellectual property (IP) through expenses that clients pay for licensing [21]. This revenue model has two pricing approaches: pay-per-use and fixed price [71]. However, service providers are shifting from perpetual licensing to subscription-based models [72]. To avoid the risks associated with the licensing revenue model, which may result in the license holder benefiting at the service provider's expense, robust intellectual property rights are necessary [19].

2.4. Freemium

Freemium is a model where clients can use a product or service without charge but may need to pay [65] for extra functionalities or continued usage [19,73]. This model is extensively employed in digital services and products, such as online services, computer programs, and interactive entertainment [74]. The freemium business models, especially the digital one, rely on a small number of valuable clients for most of their revenue, which necessitates applying predictive models to recognize their valuable clients besides support plans to maintain them [75]. Firms face a critical choice regarding the extent of functionalities they provide to their clients without charge and the amount and approach they adopt for charging premium clients [73]. LinkedIn, Spotify, and Dropbox are examples of the freemium revenue model [76,77]. Regarding the industrial environment, Physical Freemium is a business model that combines a physical product with a free digital service, which clients can upgrade to premium services for a fee [78].

Unlike some literature, such as Liu et al. [74], there is a belief that the freemium model in some industries, like IT and games, may not be as effective in generating revenue as thought [65,79]. The results in converting free clients into profitable ones have not been satisfactory, and there is uncertainty about the model's practicality [19]. However, the freemium model's conversion rate to valuable premium clients relies on the quality of its chargeless services or products [74] as one possible factor. The choice between freemium and advertising models depends on the product or service quality offered, so the freemium model is suitable when the primary service grade is down; and the premium service grade is elevated, while the advertising model is appropriate when the primary service grade is elevated and the premium service grade is down [80].

2.5. Subscription

Subscription is a revenue model where clients pay a recurring expense to access outcomes, continuously delivering value rather than focusing on one-time product selling [64], which is suitable for clients searching for risk reduction, time saving, and consistent serviceability and utilizing your services as repeated, persistent, or cyclical [24]. Clients spend a periodic cost for premium services under a subscription model, irrespective of volume use, while retaining access to some services at no cost [64,81]. Netflix [82] and Amazon [83] are examples of the subscription revenue model.

Subscription can be mixed with other revenue models, such as advertising [81]. Still, the choice between advertising, subscription, or a combination of both depends on the differentiation in quality between primary and premium services [84]. Regarding the software industry, subscribing to a service is similar to leasing it [72].

2.6. Outcome-Based

While there are studies on outcome-based contracts in other industries, such as healthcare [85], besides "the defense and aerospace sectors, as well as in medical equipment, transportation, and machinery industries, such as engines and elevators" [40], there is a lack of studies in the AEC industry. The outcome-based contract is a " mechanism that allows the customer to pay only when the firm has delivered outcomes, rather than merely activities and tasks" [86]. Another definition is "an agreement between the provider and the customer that the provider provides total solutions and is paid based on the outcomes of the solutions or the outcomes of customer value in a continual use situation" [87].

Outcome-based contracts involve offering outcomes stemming from that product rather than solely offering a product, in which the product refers to a complicated and intricate engineering with an extended lifespan, which requires heavy investment to develop and upkeep it [40]. Outcome-based contracts, as the most advanced level of service offering that product firms offer, do not concentrate on "activity and processes" and cause increasing profitability and competitive advantages besides reinforcing connections [88] and expense effectiveness for clients [86]. However, contract-related and execution-related issues are two primary risk classifications for outcome-based revenue models [87]. For instance, Caterpillar provides outcome-based contracts, ensuring the outcome of equipment and costs for operating hours and offering substitute equipment if necessary [88].

Based on the perspective offered by Grubic & Jennions [40], Availability and Economic Result are distinct outcome-based contract types in which availability is more common and focuses on ensuring the accessibility of the product or service, while the Economic Result guarantees the achievement of practical outcomes. Caterpillar's outcome-based contract might be an example of Availability.

2.7. Performance-Based

Outcome-based and performance-based terms have been employed identically or alike [40,89]. Performance-based contracting, which is equal to advanced services [90], is mentioned as a more specific version of outcome-based [86]. Performance-based has been defined as "contracting on performance rather than tasks or inputs by the service provider" [63]. It wants to "manage suppliers based on outcome (not process), put them in their expert role, and shift responsibility to the supplier by providing it with more freedom to decide how to deliver the desired performance" [89]. There are two standpoints for a machine's outcome: operational availability time and the amount of material excavated [40] as its function or performance. It could highlight the disparities between the outcome-based and performance-based models.

In performance-based contracting, the same as outcome-based, the focus is only on achieved results, not on tasks performed by firms [86], which is employed as an incentive tool [91]. Performance-based contracting is suitable for long-term agreements and can be broken down into risk, incentives, and performance as its elements [92]. Deliverables in performance-based contracting refer to client contentment, besides availability, utilization,

or reliability of outcome [89]. Manufacturing sector researchers commonly discuss two payment methods for performance-based contracting: pay-on-availability and pay-per-use, instead of pay-for-equipment [93].

Rolls-Royce Aerospace has implemented the "Power by the Hour" instance, allowing clients to pay for the jet engine's power usage instead of purchasing it physically, opening up new revenue stream opportunities for Rolls-Royce [94]. The above case exemplifies a performance-based revenue stream [92] that replaces asset sales. Concerning the AEC industry, performance-based thinking implies concentrating on socially accepted outcome functions instead of technical obligations [95]. Performance-based contracts have also been utilized in the built environment field [96]. Regarding AEC, besides the operation and maintenance industry, service providers desire to improve their business by applying a performance-based contract to increase efficiency, reduce costs, and improve client satisfaction [97]. Performance-based contracts are more costly in the primary stages, and this contract should have two conditions: long-run continuity and a specific turnover level [97].

According to Selviaridis & Wynstra [92], applying performance-based contracting can provide a variety of advantages such as (1) efficiency enhancement, (2) financial responsibility enhancement, (3) innovative solutions, (4) greater budget adaptability, and (5) social aspects focus besides environmental issues. According to Gruneberg et al. [98], performance-based contracting allows for greater autonomy and decision-making power for service providers in the AEC, but it also comes with financial risks that could potentially impact their stability. Balancing these risks and rewards is crucial for success, especially in the AEC industry, where unforeseen expenses may not always be recoverable from clients [98].

When comparing performance-based contracting and fixed price, performance-based can potentially enhance resource distribution and alignment between clients and suppliers [92]. According to Ng & Yip [63], the performance-based revenue model can pose a challenge for businesses that prioritize client-centricity, as it may impact their ability to provide scalable and replicable services in the upcoming products consistently; so a clear comprehension of the value proposition is crucial, and close collaboration between the client and provider to achieve successful value creation is required, particularly when they are engaging in co-creation.

3. Methods

This qualitative and abductive research uses a mixed-methods approach, including a literature review, a case study, and focus group discussion, to investigate and compare alternative revenue models for construction consulting firms to capture value from their self-developed digital tools. The process was carried out in two rounds. The first round involved identifying and selecting revenue models suitable for the digital tool developed by the case firm, taking into account its features and target markets. The second round focused on evaluating the selected revenue models. The research process is illustrated in Figure 1.

Interviews in the first round led to the exclusion of specific revenue models and the selection of the four chosen ones: Outcome-based, Performance-based, Subscription, and Freemium. As shown in the "First Round" section below, other revenue models, such as Revenue sharing, Licensing, and Advertising, were excluded from this research. Data were collected through a literature review, and empirical data were gathered from observations, tool utilization, open interviews, reading, and the analysis of firm internal documents and processes. The empirical data collected in this step shape the primary findings, which have been used as input for the focus group discussions. After conducting two focus group discussions, the discussion section has been completed accordingly.

Seven open interviews were conducted with four individuals in five roles at the tools provider's organization. The interviews lasted between 45 min and 2 h. The interviewees held various roles, including one who was the department manager and senior manager,

as well as three other people who were structural engineering manager, senior structural engineer, and associated structural engineer.

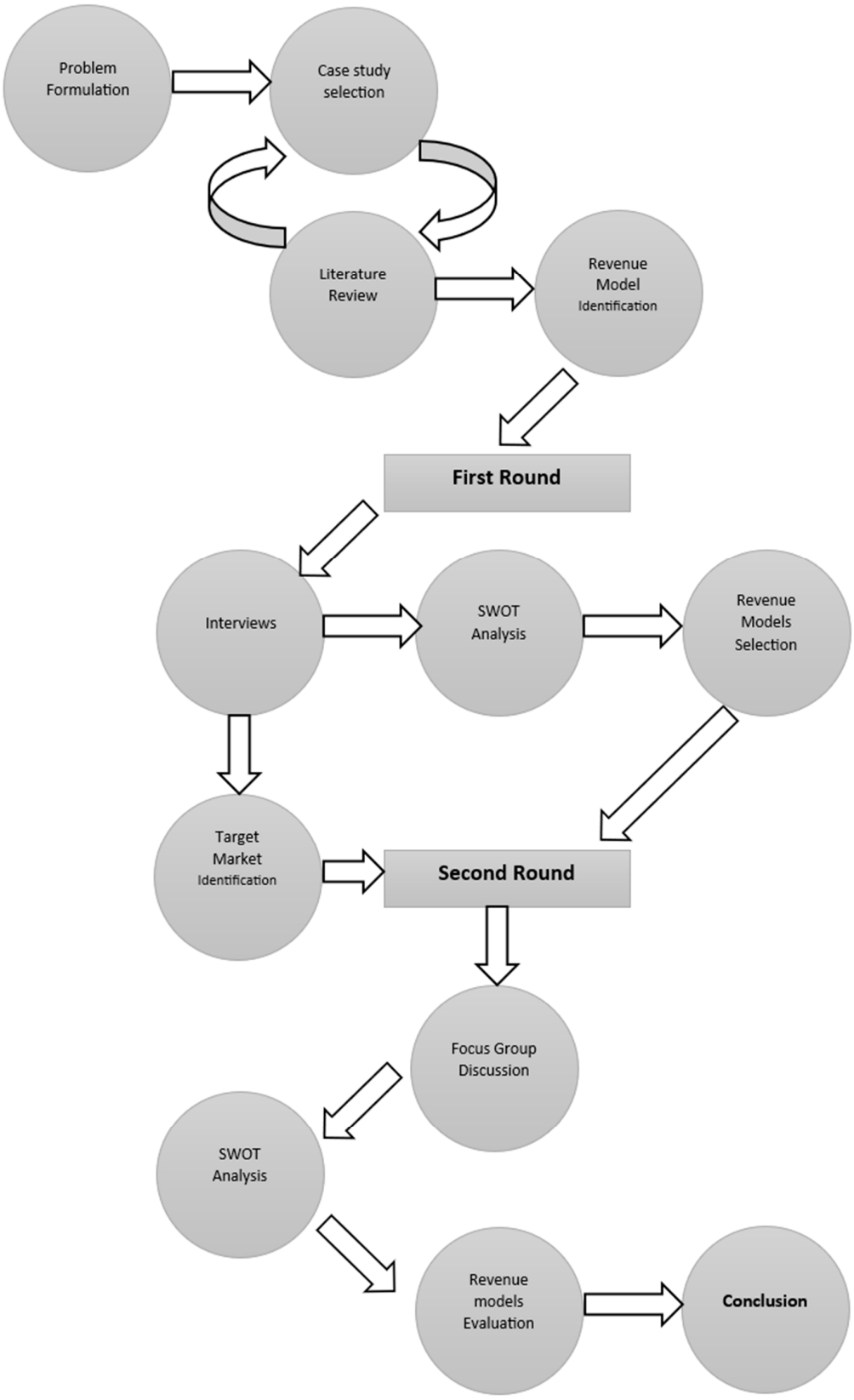

Figure 1. Research Process.

Additionally, there were four shorter unstructured interviews with other structural engineers, lasting less than 30 min, with some of their insights used in this article.

This study used two primary data analysis methods: qualitative analysis for empirical data, such as unstructured interviews, meetings and internal documents; and comparative data analysis to compare the revenue models. Each model underwent a SWOT analysis to compare alternative revenue models, and then the models were compared based on their SWOT results.

Selecting and utilizing a revenue model depends on contextual factors. For instance, choosing a tool for a specific industry and potential clients can result in selecting a different revenue model than another tool in another sector and clients. The case study method provides an understanding of the context in which this digital tool can be deployed. The selected case is a tool by a construction consulting firm designed to automate and optimize the design and analysis of reinforced concrete slab foundations.

3.1. Case

The case firm is the Swedish branch of an international construction consulting firm. Among other tools, it has developed a digital tool that streamlines the creation and analysis of reinforced concrete slab or foundation models. Initially designed for internal use by structural engineers, the tool was created to improve efficiency in the structural design and calculation processes. This tool was developed based on one of the frequently repeated projects to provide a digital product-based service rather than the current project-based approach. The tool is part of a larger automation project known as Steel Hall software, and the findings of this research could inspire further investments in and development of software intended for steel hall design automation.

The tool is a solution for dimensioning, modeling, and producing calculation reports for slabs on the ground using Tekla Structures. It introduces a level of automation and precision previously challenging in the manual design and analysis of reinforced concrete slabs, increasing efficiency. It is best suited for the more standard load conditions and buildings with a maximum of two floors. It automatically generates a model that includes reinforcement, insulation, and an edge beam following design specifications. The case firm has developed and currently owns this tool, which can be used as standalone software or as part of the Tekla environment. The software also features a theoretical manual in PDF format and a presentation movie, which can help beginners understand the software's functions and how they work.

There are reasons to consider this tool for the case study. The construction consulting firms in Sweden rely on hourly-based revenue models in addition to their project-based nature, which means that more work hours on projects equals more profit. In contrast, digital tools can facilitate a shift towards a more product-based approach. However, the product-based approach typically involves fewer work hours than the project-based one, leading to lower profits. This dilemma represents the digitalization paradox for these firms. While investing in digitalization, they may experience reduced profitability. The reason is that their standard revenue model is based on hourly rates, but the product-based approach reduces project time, conflicting with their current revenue model.

Consequently, they are hesitant to invest in extensive projects like Steel Hall because digitalization, which leads to product-based services, is costly, and having a clear return on investment (ROI) for the provider firm is essential. The dominant context of construction consulting firms revolves around hourly- and project-based approaches, making it challenging to achieve an appropriate ROI for developing such tools in this context. Adopting this tool as a case study that enables a product-based approach through digitalization allows the firm to explore alternative revenue models instead of solely relying on hourly-based ones. It addresses the digitalization paradox and is particularly relevant for AEC firms seeking to develop product-based digital tools within their current hourly-based revenue model. However, it also paves the way for those interested in developing product-based digital tools to consider different contexts regarding the return on investment rather than

current hourly and project-based contexts. There are various approaches to developing and product-based digital tools in the AEC industry, with BIM being one example; however, the tool used in this study represents a different form of digitalization, focused on automating design processes.

3.2. First Round, Revenue Models Selection and Target Markets

The first round of findings was mainly based on observation and open interviews. Several criteria were considered when selecting the appropriate digital tool for the case study. These include the potential for selling the tool as a standalone service, the ability to market it to a broader range of clients instead of tailoring it to one specific client, and the tool's potential for future development.

One of the criteria for choosing the tool was its potential to be sold as a separate service, which we do not see how with the hourly-based model since the tool provides results much faster than a structural engineer. The question that came up was about possible alternative revenue models. The relevant literature has been studied to explore potential alternatives and further discussions with the case firm. The first round will explain how some revenue models were excluded based on the literature, the findings of unstructured interviews, and researcher comprehension in an iterative process. The same procedure has been utilized to identify some possible target markets. These potential target markets were then used as input for the focus group discussion to help facilitate the discussion by providing specific contextual examples. The first round uses the SWOT analysis method to select appropriate revenue models.

3.3. Second Round and Focus Group Discussion

This study obtained insight from the recommended process for the focus group discussion, FGD, by O. Nyumba et al. [99]. The goal, questions, participants, and location were determined during the design phase. However, suggesting the next steps based on the FGD results [100] to the tool provider firm is beyond the scope of this study. In this study, the meetings were online using Microsoft Teams. The FGD aim is to gather qualitative data by comparing alternative revenue models for the tool to comprehend the validity and reception of these models. The questions have been formulated considering the FGD aim, the literature, and other relevant empirical data.

Two focus groups were conducted to investigate and compare alternative revenue models from the perspective of the case firm. Each focus group consisted of three participants and lasted for two 60 min discussion sessions, focusing on four revenue models.

Participants were selected based on their professional roles and expertise within the construction consulting industry. They share a common concern about developing new technology for the firm. The goal was to ensure a diverse range of perspectives that could contribute to a comprehensive evaluation of the revenue models under consideration. The group included key players: a technology and method specialist, a lead structural engineer, and a head of department. However, due to their different roles, they have varying perspectives on this matter.

Department Managers: Responsible for overseeing project delivery and maintaining long-term client relationships, their insights were crucial for understanding each revenue model's financial and strategic implications.

Senior Engineers: Experts in implementing digital tools like Building Information Modeling (BIM), they provided practical insights into how revenue models would affect the operational efficiency of the firm.

Technology Specialists: These participants developed and applied digital solutions, offering a perspective on the technical challenges and opportunities associated with different revenue models. This selection process ensured that various viewpoints were considered in evaluating the revenue models, from business strategy to technical implementation. These participants were chosen for their valuable insights into the project.

Table 1 was prepared as input for the focus group discussion. Based on the literature and preliminary findings of the first round, the table briefly explains the different revenue models articulated for the participants. The literature is primarily used to populate the table. The information gathered from the first round, in addition to the writers' comprehension, informs the "Potential Clients" and "Target Market Application" sections of the table.

Table 1. Focus Group Discussion Input.

Feature/Model	Hourly-Based	Freemium	Subscription	Outcome-Based	Performance-Based
Primary Focus	Time spent on services or product [37]	Basic free services with paid premium features [19,65,73]	Ongoing access to services or products [64,81]	Delivery of specific, measurable outcomes [86,87]	Achievement of specific performance metrics rather than tasks [63]
Payment	Based on hourly rates [37]	Free for basic services; Pay for additional features [19,65,73]	Recurring payment for ongoing access [64,81]	Based on the achievement of outcomes [86,87]	Based on meeting performance criteria [86]
Examples	Construction consulting firms [37]	Linkedin, Dropbox, Spotify [76,77]	Netflix, Amazon [82,83]	Caterpillar [88]	Using "Power per Hour" instead of buying a jet engine [94].
Target Market Application	Suitable for projects where effort/time is predictable	Suited for attracting a large user base or where trial use is essential	Suited for cases where continuous use is necessary	Suited for clients seeking specific results	Suited for long-term projects requiring functionality and performance
Possible Clients	Current clients	Trial version, Students, Red Cross	Freelancers, Small firms and startups	Älvsbyhus [1]	Boklok [2] Lindbäcks [3]

[1] www.alvsbyhus.se; [2] www.boklok.se; [3] https://lindbacks.se/.

It is important to note that this study does not consider the client's viewpoint. Some limitations arise due to the limited scope of this study. Specifically, we did not consider other elements of the business model or their alignment with value capture. We did not examine pricing mechanisms, other financial value, and other value capture aspects. It is also worth noting that the legal and contractual aspects of implementing alternative revenue models were beyond the scope of this research and, therefore, were not considered.

4. Finding and Discussion

4.1. First Round: Revenue Models Selection and Target Markets

The first round focuses on selecting specific revenue models while excluding others. The first revenue model to investigate is licensing. The case firm has emphasized that its core business does not allow it to engage in activities that are not aligned with its business objectives. While some interviewees believe that selling software or other digital tools licenses does not align with the firm's core business, others consider the licensing revenue model a viable option due to its proven scalability potential in other industries. On the other hand, service providers are shifting from perpetual licensing to subscription-based models [72]. One interviewee suggested a licensing model for the tool, citing Tekla's pricing as an example. However, Tekla's pricing is not a licensing but more similar to a subscription, an outcome-based model, or a combination. One interviewee suggested implementing a licensing model but had difficulty deciding between a subscription-based model and licensing due to their similarities regarding this tool. At the same time, two pricing approaches of the licensing model are pay-per-use and fixed price [71], which are covered by outcome-based (pay-per-use) and subscription (fixed price) models. Licensing was not selected due to its incompatibility with recurring revenue goals and intellectual property challenges. Based on the factors mentioned above, the Licensing revenue model does not apply to the tool developed by the case firm, and it is excluded from the list of revenue models to be investigated in the second round of this study. However, property

rights are an issue that should be considered [19] when using other revenue models that cover this model.

The second revenue model is revenue sharing, which is appropriate for distributing gains and losses [69], but the project should be large enough to share its substantial gain. This tool is unsuitable for revenue-sharing models due to its limited scope, resulting in lower profits than what needs to be shared among different partners. However, the case firm has developed other comprehensive and complex digital tools that it might be possible to apply to this revenue model. Revenue sharing can be used with [70] or without a percentage [69], depending on the mentioned tools' scope and the efficiency level required. According to interviewees, assessing a firm's revenue for sharing can be challenging as firms prefer not to disclose their financial information. The tool's scale did not justify the complexity of managing shared revenue agreements. Based on the information provided, it has been decided that this revenue model should be excluded. Nonetheless, according to the findings, this revenue model could be suitable for other jointly developing similar tools.

The next revenue model is advertising. To generate revenue through advertising [21], advertisers pay per click or action [67] only for smaller groups that are actual clients. Offering services or products to have access to many potential clients [66] is essential to generating revenue through the advertising model by targeting actual clients as a smaller group. The interviewees believe that the tool's audience is limited. Therefore, unlike YouTube or Facebook, this tool does not have a large audience that can be used for advertisement as a primary revenue model. According to the interview results, watching an advertisement during work or a serious project is considered unprofessional. Accordingly, the decision has also been made to exclude advertising due to the limited user base and its disruptive nature in a professional context.

As another revenue model, asset sales involves the one-time selling of physical products, which does not apply to this specific digital tool, which is also emphasized in interviews, since this tool is not physical, besides the fact that it should be sold multiple times. Asset sales was dismissed as the digital tool requires ongoing support, making a one-time sale inappropriate. The decision has also been made to exclude asset sales. On the other hand, some selected alternatives might cover excluded revenue models. For example, usage fees may be considered similar to outcome-based revenue models due to the nature of this tool and the similarity of results, as confirmed in an interview. In the same way, it will be possible to exclude the Brokerage Fee by utilizing a subscription, for instance, in the case of small consulting firms. Brokerage fees were excluded due to their complexity and misalignment with the tool's scope. However, one interviewee believes that charging brokerage fees allows the provider firm to access a broader range of clients. Revenue models like leasing are more cost-effective for clients than creating a tool. However, in the same way, renting, lending, and leasing are covered by the subscription model or short-term licensing, as interviewees mentioned. Renting, leasing, and lending were rejected as they are more suitable for physical products.

Some potential revenue models have been excluded up to this stage. Here, we will discuss why some others were selected. The freemium revenue model is the first one. The interviewees expressed contrasting viewpoints regarding the freemium revenue model. Some participants suggested that providing the tool for free could have branding benefits and attract engineers from other firms to the provider's tools. Conversely, others proposed that the free version could serve as a demo, potentially leading to the sale of the complete tool. Therefore, this tool has been selected to be investigated in the second round. However, there is also the risk that users may perceive free tools as less professional or reliable, which can affect the tool's reputation and user trust.

During the interviews, it was mentioned that assessing specific outcomes or performances would be challenging. However, some participants faced difficulty comprehending specific alternative revenue models, such as outcome-based and performance-based, especially concerning the particular tool being discussed. They were more familiar with the revenue models they regularly use in their everyday lives or jobs, such as subscription-

based models. Consequently, they suggested those revenue models for target markets. However, after discussing the meaning of outcome-based and performance-based models in this tool, some changed their minds and, for instance, favored outcome-based revenue models over subscription models. The definition of the outcome-based and performance-based revenue models' tool is customized for the tool based on the interviews and the writers' comprehension. At the same time, based on the interviews, the decision between an outcome-based and subscription model depends on the client's cost. The advantage of the subscription model is that clients are aware of the fixed amount they need to pay within a specific period.

The four revenue models, freemium, subscription, outcome-based, and performance-based, were selected for their compatibility with the digital tool and ability to create long-term client relationships and stable revenue streams. Freemium was chosen for its ability to attract a large user base, acting as a marketing tool with upselling potential. Subscription provides predictable, recurring revenue, supporting financial stability and scalability. The outcome-based model ties payments directly to client outcomes, fostering stronger client relationships but requiring performance tracking. The performance-based model focuses on measurable performance metrics, ensuring alignment between client and provider while promoting efficiency despite the complexity of implementation.

Based on the similarities identified by Grubic & Jennions [40] and Nullmeier et al. [89] and the fact that the performance-based revenue model is a type of outcome-based model as mentioned by Ng et al. [86], regarding this tool, we have decided that clients seeking a specific outcome through the integration of the tool into their system will be offered the performance-based revenue model. However, the revenue model will be outcome-based if the integration is unnecessary. Combining revenue models, as Tekla did to sell their products to consulting firms, is another suggestion revealed during the interviews.

Table 2 has been made based on an analysis of the literature and interviews. It provides a detailed comparison of the revenue models, explaining the reasons for their selection or exclusion. Although some revenue models were excluded in the first round of this study for the specific tool examined, they may still be appropriate for other types of digital tools in the construction consulting industry. As a result, this study has chosen to investigate four revenue models: Freemium, Subscription, Outcome-based, and Performance-based.

Table 2. Revenue Model Selection for the Tool.

Revenue Model:	Strengths and Opportunities	Weaknesses and Threats	Reason for Selection or Exclusion
Freemium	Attracts large user base, potential for upselling premium features [19,65,73]. Opportunity for combining with physical products [73]. Potential to serve as a demo leading to full tools version sales, effective marketing tool, branding benefits, and potential to attract engineers from other firms (interview).	Low conversion rate and support and development costs [19,75],. Ineffective revenue model [79], unpredictability [19].	YES: Selected for investigation due to its demo and branding benefits; potential to convert free users to paying clients.
Subscription	Predictable recurring revenue [64], fosters long-term client relationships [24]. Preferred for its predictability (interview). Combine with advertising [81], suitable for clients seeking consistent service [24].	It requires continuous development and support, as well as pricing challenges. Economic downturns affecting renewals (interview).	YES: Selected for investigation due to its predictability and alignment with client preferences for fixed costs and predictability.

Table 2. *Cont.*

Revenue Model:	Strengths and Opportunities	Weaknesses and Threats	Reason for Selection or Exclusion
Outcome-based	Aligns payment with client outcomes, promotes profitability and competitive advantages [86,88]. Favored over subscription models by some interviewees (interview).	Contract and execution risks [87]. Requires high initial costs [40], robust performance tracking. Potential challenges in assessing and precisely measuring specific outcomes or performances (interview).	YES: Selected for investigation due to its alignment with client outcomes and potential for fostering long-term relationships.
Performance-based	Focuses on measurable achieved results, alignment of client and supplier interests [86,92]. Advance services [90], suitable for long-term agreements, budget adaptability, innovative solutions, efficiency enhancement, and cost reduction [92,97]. Entering new markets; challenging to comprehend initially but preferred after explanation (interview). Tool in this revenue model can be tailored to suit specific target markets (interview).	High initial costs, necessity of long-term agreements, and specific turnover level [97]. Balancing risks and rewards [98]. Challenges in determining performance criteria (Interview). Unfamiliarity with this revenue model in the industry.	YES: Selected for investigation due to its focus on measurable outcomes and potential to enhance service quality and client satisfaction and long-term relationship.
Asset Sale	Generates immediate revenue through the sale of tangible assets [21].	Replacing by performance-based [92]. Not applicable to the digital tool being studied. No recurring revenue. Limited post-sale client relationship.	NO: The tool is digital, not a physical one, making asset sales irrelevant and misaligned with the firm's offerings.
Usage Fee	Revenue proportional to service usage, direct link between revenue and service delivery [21]. Attracts broad client base with flexible payment. Suitable for varying service demand. Covered by outcome-based model (interview).	It requires robust tracking systems; revenue can be unpredictable and unstable (interview).	NO: The outcome-based model already encompasses the principles of the usage fee model for this tool, making it redundant to consider separately.
Brokerage Fee	Generates revenue by facilitating, applicable in other industries [21]. Potential for high revenues in high-value transactions, covered by subscription model in the case of small consulting firms (interview).	Dependent on transaction volume; significant effort is needed to establish a network (interview).	NO: Subscription models could better serve small consulting firms, and brokerage fees were less relevant to the tool's application (interview).
Renting, Lending, Leasing	Regular and systematic revenue streams [21]. Covered by a subscription model [72] (interview). Appeals to clients are avoiding significant upfront investments (interview).	The subscription model or short-term licensing can cover it; it is more suitable with physical tools (interview).	NO: Subscription or short-term licensing models are more suitable for the tool, as renting or leasing does not align well with its digital nature (interview).

Table 2. *Cont.*

Revenue Model:	Strengths and Opportunities	Weaknesses and Threats	Reason for Selection or Exclusion
Advertising	Significant revenue [21], with a large audience. Combine with other models for maximum revenue [68].	It requires a large user base and can be intrusive. Limited audience for the tool, not suitable as primary revenue model for this tool (interview).	NO: The limited user base and the nature of the tool make advertising a less effective primary revenue model (interview).
Revenue Sharing	Aligns incentives, encouraging innovation and efficiency [69]. Suitable for collaborative projects or partnerships.	Requires transparent revenue tracking, complex management. The tool's scope is too limited for revenue sharing (interview).	NO: The limited scope of the tool does not justify the complexity of revenue-sharing agreements, which are more suited to larger projects with substantial gains (interview).
Licensing	Generates revenue through utilization rights [21]. Applicable across industries, potential for rapid scaling.	Shifting to subscription models [72] requires IP management. Firm's core business not aligned with licensing model (interview). Licensing risks [19], market shift to subscriptions.	NO: The firm's strategic focus does not align with licensing, and shifting to subscription model was considered a more suitable choice.

Possible Target Markets

As revenue in the AEC industry refers to "the cash a company generates from each customer segment" [54], the selection of the tool was based on its potential to be sold to a broader range of clients or target markets. If there is only one potential client, the revenue model options will be more limited than if the tool can be sold to a broader range of target markets. During interviews, one frequently asked question was, "For which (type of) clients"? Understanding the client or the type of market target was crucial for identifying a suitable revenue model. Interviewees alter the choice of an appropriate revenue model by selecting different clients.

In addition, interviewees suggested that the tool should be adjusted for specific clients to generate revenue for the provider firm; different revenue models may be needed for target markets, and it could be appropriate to use various revenue models simultaneously. Some specific target markets may not have a high potential for selling the tool, but it can still serve as a valuable example for investigating potential challenges and opportunities. The current version of the tool might be customized to fit each specific target market.

During the interviews, it was highlighted that certain risks are associated with selling the tool as a separate service or product. One risk is its potential impact on the tool provider's competitive advantage. Another risk is that the tool may become too ubiquitous once sold. Although it may initially seem advantageous, competitors or other actors will likely copy the tool. Another challenge is balancing the profits from selling the tool with the competitive advantages it provides to the other actors or competitors. It is crucial to balance risks and rewards [98].

The interviewee believes the firm should move forward to automate more tools; if they do that, they can no longer rely on the hourly-based model. However, the only alternative option interviewees have in mind is a fixed price. They even mentioned the fixed price after discussing the alternative revenue model. However, fixed price, as the price structure, is a concept related to the revenue model, not a replacement. A specific revenue model can have different price structures, including fixed prices [71]. The differences between these terms should be clarified more in the industry. However, literature such as Selviaridis & Wynstra [92] compared fixed prices with a revenue model.

The focus group discussions used the possible target markets as input. Based on the results of the first round, we have identified the following target markets. The tool could

be marketed to competitors, but the provider should consider its competitive advantage and intellectual property protection. Collaboration with Tekla and targeting their user base could expand the tool's reach, but there are concerns about the risks outweighing the benefits. The tool can be used or integrated into industrialized wooden house production by providing efficient and accurate modeling and calculation services. Two types of industrialized wooden house producers, such as Älvsbyhus and Lindbäcks, have different needs for the tool, with the potential to utilize distinct revenue models. International organizations like the Red Cross can also benefit from the tool's adaptable design process for humanitarian construction projects; however, the tool should be adapted to meet local regulations. Building inspection and certification agencies can use the tool to verify structural calculations and models, ensuring designs meet regulatory standards. Startups, students, and small firms without access to costly general software like Tekla are also potential target markets for the tool.

4.2. Second Round: Revenue Models Evaluation

In the second round, the discussion in the focus groups centered on comparing the selected alternative revenue models. The following are clarifications regarding Table 1, which was used as input for the focus group discussion. The free version should have more limitations than the subscription version, such as a restriction on the number of projects or a limit on the project's size in cubic meters. The subscription version is a more generalized tool intended for clients' use. Both freemium and subscription models provide access to this tool but are not tailored to a specific client. However, the outcome-based and performance-based versions of the tool should be customized for particular clients.

Further explanation is necessary to differentiate between outcome-based and performance-based models regarding this particular tool. In the outcome-based model, the tool is considered a tailored but separate instrument from the client's platform, and clients are responsible for input and, therefore, the resulting output. However, in the performance-based model, the tool should be integrated with the client's platform to function correctly and adjust the result to instant changes.

The results of the focus group discussions are presented below in three tables: Table 3 for freemium, Table 4 for subscription, and the last one, as presented in Table 5 for the combination of outcome- and performance-based. Due to the similarities between outcome-based and performance-based revenue models, the focus group discussion results will be presented in the same table for both.

Table 3. FGD Result, Freemium.

Freemium		
Category	**Aspect**	**Details**
Strengths	Market expansion	Potential for widespread use if it is an appropriate tool and clients apply it.
	Brand visibility	Increased visibility for the tool provider's name.
	Evaluation	Allows clients to evaluate the tool before buying.
Weaknesses	Limited version	Providing the entire set of features in the free version is not appropriate.
	Revenue generating challenges	Generating a revenue stream (solely) through a freemium model can be challenging.
	Necessity of support and development organization	Need for robust back-office functions.
	Financial issues	Freemium models are required to finance back-office functions.
	Necessity of development	The tool requires further development.

Table 3. *Cont.*

Freemium		
Category	**Aspect**	**Details**
Opportunities	Marketing Tool	The freemium model can be seen as a sales tactic to offer additional products or services. It can serve as a marketing tool.
	Demo or trial version	Offering a limited demo or trial version can attract clients.
	Packaging	It can be packaged with complete solutions for broader functionality.
Threats	Attractive alternatives	Users may find other (free) tools more attractive.
	Low converting rate	Risk of low conversion from free (freemium) to paid users (other revenue models).
	Accountability	Who is responsible for ensuring the input and output are correct if the tool is free?
	No guarantee	Free tools (freemium) typically do not come with any guarantees for functionality or results.

Table 4. FGD Result, Subscription.

Subscription		
Category	**Aspect**	**Details**
Strengths	Starting point to sell	The subscription is the primary revenue model or starting point for selling the tool by alternative revenue models.
	Scalability	Low overhead costs and quick scalability.
	Continuous and secure income	Continuous and secure monthly or annual income.
	Solely production cost	The primary overall cost is attributed to production rather than the project cost. Once developed, selling to multiple clients incurs minimal additional costs.
	Development planning	Ability to forecast and budget for development and maintenance based on predictable revenue.
	Packaging	Potential to add other existing products or services at the tool provider firm.
Weaknesses	Pricing challenges	Difficulty in finding a reasonable price level.
	Necessity of development	The program requires further development and enhancements.
	Limited functionality	The tool is currently limited and needs to be expanded to include more complex tasks.
Opportunities	Financial forecasting	It helps predict income.
	Combination with other revenue models	It can be combined with other revenue models such as freemium.
	As a base version for development	The subscription version of the tool can serve as a base for development, especially for other revenue models.
	Additional requested services	Additional services (functionality) can be offered based on the clients' requirements for extra revenue.
Threats	Sell it just one time	Risk of clients using the tool only once for repeating projects, which leads to not generating recurring revenue.
	Threats are not related to revenue models.	According to discussions, one believes that possible threats are independent of applying the subscription or other revenue models.

Table 5. FGD Result, Performance- & outcome-based.

Performance- & Outcome-Based Revenue Models		
Category	**Aspect**	**Details**
Strengths	Marketing existing assets	Possibility to market existing assets.
	Development cost recovery	Leveraging developed assets to recover development costs.
	Complement for hourly-based model	Alternative revenue models for developed assets can be utilized, in addition to the traditional hourly-based revenue model.
	Organizational level investment	Development costs can be considered a firm-level investment rather than just at the project or department level.
	Continuous income	Generating regular monthly or yearly income with minimal effort.
	Selling additional services	Performance-based (or outcome-based) tools can facilitate the sale of engineering hours or other services and products.
Weaknesses	Limited functionality and scope	The current version of this tool has limited scope and functionality and requires enhancements.
	Necessity of development	The tool needs more development and engineering judgment.
	Dependency on key personnel	Dependency on crucial personnel for support and development.
	Necessity of support and development organization	It is necessary to have an organization to support and develop, sell, train, and handle invoicing and contracts.
	High cost	Maintaining even a slim organization for the development and support of the tool can be costly.
Opportunities	Entering new markets and expanding the client base	Potential to open new markets, such as projects for specific clients like Älvsbyhus. Performance-based payments per square meter can attract more clients.
	To be service based	It is broadening services beyond consulting.
	Competitive advantage	Potential to compete with more expensive software currently used by clients.
	Resources saving for clients	Ability to reduce clients' costs and save time and resources.
	Additional client-based services	The tool can be adjusted and developed based on clients' feedback and requirements.
	Integration potential	Performance-based models can integrate into larger systems, automatically adjusting calculations.
	Integration techniques	Options include integrating this tool into larger systems or providing APIs for others to develop.
Threats	Accountability	Responsibility for the correctness of calculations and results.
	Core Business Change	There is a risk of shifting from consulting to software provision, which would not be consistent with the provider's core business as a consulting firm.
	Cost-Benefit Challenges	The necessity of ensuring the financial viability of offering the tool considering the costs of support and development.
	One-Time Sales	The risk of clients using the tool only once or for a short period leads to not generating recurring revenue.
	Dependency on the client's project volume	When selecting an outcome-based revenue model for profitability, it is vital to have repeat clients utilizing the tool across multiple projects.
	Minimum number of clients	The number of prominent clients with a complex system that can potentially apply performance-based models (to be integrated with this tool) is minimal.
	Incompatibility	Challenges arise in adapting the tool to various national regulations and construction traditions for different target markets.

4.2.1. Freemium

Regarding strength, freemium, as an effective revenue model [74], aims to attract a large user base, enhance brand visibility, and provide potential upselling opportunities (FGD). The FGD result highlights that one of the freemium model's primary strengths is its ability to expand market reach and increase brand visibility. Offering basic services

at no cost can serve as an effective marketing tool, drawing in a broad audience and creating opportunities for upselling premium features [19,73,78] to clients who might not otherwise engage with the product. Additionally, allowing clients to use and evaluate the tool before committing to a purchase [65] as a demo version can increase trust and reduce perceived risk.

When it comes to weaknesses, it is beneficial to mention that, even after upgrading to the premium version, it is essential to have a plan for retaining clients and supporting them [75]. During the FGDs, the need for support services and continued tool development based on client demands was discussed to address this issue. However, the provider firm needs to become more familiar with this type of organization, which is more common in the service industry than in the construction industry. During the focus group discussions, questions were raised about the effectiveness of this revenue model. Maintaining the free version while continuously developing and supporting premium features can be financially demanding. However, ongoing development and support necessitate robust back-office functions and organization, as mentioned in FGD, considering the limited functionality of the current version of the tool. They approved the fact that the provider firm currently does not have such an organization.

The freemium model faces significant challenges and threats, particularly in identifying and converting free users to paying clients, which is often challenging to achieve [19,75]; similarly, a low conversion rate is mentioned as a threat during FGDs. Users might be tempted by alternative tools that offer similar features without cost. Other free tool options and the professional perception of free services, such as considering them a professional alternative, pose threats. Considering the findings, providing the functionality and professionalism of the free version is vital in maintaining user trust and promoting conversion to paid versions. Additionally, ensuring accountability and guaranteeing functionality are critical to overcoming these barriers. Some literature suggests that this revenue model may be less efficient than anticipated [65,79].

Regarding opportunities, the freemium model offers basic services for free while charging for premium features [19,65,73]. It is addressed in FGDs by suggesting the freemium model as a demo version. However, it was challenging for the professionals involved in this study to reach a consensus on the specific features of this tool for the freemium or premium version. Therefore, deciding which features to include in the freemium version should be investigated. Packaging presents another opportunity for this revenue model.

Firms must balance free and paid features for this revenue model [73]. Accordingly, it seems there are two options for applying the freemium model. The first option offers the tool for free with all features included. In this option, the freemium model can be combined with the advertisement revenue model, which is excluded for reasons in the first round. Thus, this combination does not apply to this specific tool. Generating revenue solely from this revenue model is challenging, according to findings. On the other hand, based on the FGD, when the firm invests in developing such tools, it should consider the return on investment, which is unclear for this option. As mentioned, a clear return on investment (ROI) is an essential concern for the provider firm, so the expected outcome for this option might be increasing brand visibility or expanding the market for other products and services. At the same time, according to the findings, this model allows for creative packaging with other services, enhancing overall functionality and appeal. The packaging opens opportunities to provide new services, products, or a combination of products and services.

The firm could consider offering a limited version of the tool as the second option in the freemium revenue model, which means that the client would pay to access the premium features, as Teece [19] and Runge et al. [73] suggested. It aligns with the feedback from the FGD, which emphasized the tool's potential to drive overall tool sales by serving as a demo version. In this scenario, the freemium model should be combined with other revenue models to be used effectively as a marketing tool. Combining distinct revenue models

mentioned in the literature [68,81], it can function as a demo or trial version, encouraging users to eventually invest in the full version, supported by literature such as the study by Weinberger et al. [78]. The premium version could be offered through other revenue models, such as subscriptions, performance-based revenue models, or a combination.

4.2.2. Subscription Revenue Model

The discussion begins with opportunities. This model can be utilized as a stand-alone revenue model. However, during the focus group discussion (FGD) and literature review [81], it was highlighted that the subscription revenue model presents opportunities to combine it with other revenue models.

For example, the freemium model can be offered as a demo or a limited version for specific clients. In contrast, the subscription revenue model can serve as the premium version and the entry point for selling the tool. With its financial forecasting feature, the subscription revenue model facilitates investment and planning for these developments. On the other hand, it aids in having a more apparent ROI. Based on the FGD results, the version of this digital tool developed for the subscription revenue model can serve as the base software for tailoring to other revenue models, such as outcome- and performance-based revenue models. Some non-essential features may be excluded when extracting the freemium version of the tool from the subscription one.

When it comes to threats, according to Schuh et al. [64], the subscription revenue model provides continuous value instead of concentrating on one-time sales. Conversely, construction consulting firms primarily offer project-based services, which are one-time sales. Applying a subscription revenue model can allow them to move beyond the one-time sale by transitioning from a project-based to a product-based approach. However, the potential risk of clients using the tool only once or for a short period is significant, as highlighted in the FGD. It can pose a more specific threat to clients who have recurring projects with nearly identical outcomes. Some issues, such as economic downturns, can also affect subscription renewals. However, some participants of the FGD believe that threats are more general and unrelated to a specific revenue model. Finding an appropriate pricing level is critical to ensure the model's success besides the converting rate.

Regarding strengths, the subscription model is praised in the literature for its predictable recurring revenue and for fostering long-term client relationships [24,64]. Our study aligns with these findings, underscoring the model's ability to offer continuous and secure income. Using a product-based approach, the tools provider firm developed this tool from a repeating project. It aligns with features highlighted in the FGD, such as scalability and having only the production cost of this revenue model. Having only production costs means a product-based approach is appropriate for this revenue model. As a feature of this revenue model highlighted by FGD, scalability is challenging to the project-based approach. It underscores the significance of considering a product-based approach. Subscription services can scale quickly with low overhead costs once the initial development is completed. The subscription's product-based approach and periodic cost make the volume usage billing irrelevant [64,81]. This revenue model can be an example of changing the short-term profit-making approach [29] into repeating client payments [21].

Risk reduction, time saving, and consistent serviceability [24] are the features of this revenue model that lead to client satisfaction. Considering these aspects of client satisfaction (such as consistent serviceability) and FGD results, to address weaknesses, the provider firm should create a development plan due to the tool's limited functionality and in response to clients' upcoming demands. According to the findings, constant development and support are necessary to keep the tool relevant and competitive, posing significant challenges. Considering the result, multiple steps are available to develop and expand the tool's features. As a first step, the tool needs to be enhanced to meet the broader market's requirements, as it currently has limited features. The next step is to consider additional services requested by clients. Another step is to package this tool with other existing tools or services in the tool provider firm.

4.2.3. Outcome-Based and Performance-Based

Due to the similarities between outcome- and performance-based revenue models [40,89], this study discusses both simultaneously. However, they also have some distinctions [86]. Discussing strengths, these two revenue models are applied to deliver comprehensive solutions in an ongoing usage scenario, prioritizing the client's value [87] over specific assignments and actions regarding the payment [86]. This innovative solution that enhances efficiency [92] stems from a complicated engineering product with an extended lifespan [40] by focusing on function rather than technical obligations [95], which aligns with the case study tool investigated in this study. However, more investment and development are necessary to utilize this tool with outcome-based or performance-based revenue models. Specifically, architectural, engineering, and construction (AEC) firms utilize these revenue models to enhance efficiency, reduce costs, and improve client satisfaction [97].

This study tries to focus on these revenue models as an alternative. However, based on the results of the FGDs, it is believed that these revenue models complement the hourly-based revenue model or are a way to attract clients to sell additional services using the currently hourly-based revenue model. It shows a strong path dependency and reliance on the hourly-based revenue model despite admitting that it is more common in Sweden than in other countries. Other industries are considering these two revenue models [40,85], and AEC should also take action. Based on the findings, considering that the case firm already has other developed tools besides this tool, these two revenue models can be utilized as marketing tools. Fixed price is mentioned as a replacement for the hourly-based model in the FGDs; however, performance-based contracts offer multiple advantages over the fixed-price option, including improved resource allocation and an alignment of client and supplier interests [92]. Differences between the revenue model and pricing mechanism are mentioned in the first round.

The outcome-based revenue model is characterized by clients' ongoing usage scenarios [87], which is not aligned with the project-based approach. At the same time, because the construction consulting industry operates on a project-based approach, investments in tool development are mainly made at the project level. Regarding investment, these revenue models are more costly in the primary stages and should have a specific turnover level [97]. However, the findings from the focus group discussions suggest that investments in creating tools with features enabling their use on an outcome or performance-based basis should be supported at the organizational level. In addition to recovering the development cost of tools already developed at the case firm, as mentioned in the FGDs, these two revenue models facilitate investment in the development of the upcoming tool. The literature emphasizes the necessity of heavy investment to develop and upkeep it [40].

Integration is considered as an opportunity. On the other hand, the literature mentions two types of these revenue models: Availability and Economic Results, with a power-by-the-hour contract as an example of the Economic Result [38], which is an integrated service in the client platform. Based on the findings of the first round presented in Table 1, for this tool as a specific case, Availability is more aligned with the outcome-based revenue model, and the Economic Result is more aligned with the performance-based model, which should be integrated into the client's system. As emphasized during the focus group discussions, the tool can potentially integrate into larger systems, for example, for automatic calculation adjustments. Providing APIs to clients is another option for integrating with their systems, according to FGDs.

The payment system in these two revenue models is based on the outcomes delivered to the clients, regardless of activity and processes [63,86,89], which causes financial responsibility enhancement [92]. On the other hand, greater budget adaptability [92] increases clients' ability to save resources (FGD). Implementing these revenue models can provide higher competitive advantages and increased profitability [88], besides expense effectiveness for clients [86].

A performance-based revenue model can be applied to establish long-term client relationships [92]. On the other hand, utilizing these two revenue models creates opportunities for clients and tool providers. As discussed in the FGDs, this approach can open new markets and expand the client base. Additionally, clients can have a customizable version of the tool that can be adapted or integrated into their systems. On the other hand, it gives the provider firm the autonomy to decide which mechanism and process to use to deliver value [89,98].

In addition to the investment, other financial issues should be considered. Regarding weaknesses, as mentioned in the FGDs, the current version of this tool has limited scope; therefore, a support and development organization must exist for the upcoming and more comprehensive version of the tool.

As emphasized in the FGDs, this saves the client's resources and enhances the provider firm's competitive advantages, but it makes revenue generation dependent on the client's project volumes. Nevertheless, possible payment methods for the performance model include pay-on-availability and pay-per-use [93]. The pay-on-availability method can expect regular periodic revenue, while the pay-per-use method makes the revenue dependent on the client's project volumes. However, this study does not cover the payment method.

When it comes to threats, maintaining the support and development organization and the tool's development process entails significant financial costs that should be considered. Cost–benefit challenges must be considered to ensure the tool's financial viability regarding the support and development costs (FGD). Balancing is crucial where unforeseen expenses may not always be recoverable from clients [98].

The performance-based approach should include client contentment and the reliability of the outcome [89]. However, it is unclear who is responsible for ensuring compliance with regulations and the accuracy of the results when using this tool (FGD). This issue must be addressed due to specific rules that must be adhered to (FGD). Other risks should also be considered, such as contract- and execution-related risks [87]. If applying these two revenue models leads to a shift from consulting to software provision, which is not aligned with the core business of the tool's provider firm, it should be considered a threat (FGD). However, these revenue models aid the provider firm in focusing on their expert role by providing an opportunity to decide about the value delivery method [89] because the focus is on the performance, not the tasks [63]. On the other hand, this tool was designed for the Swedish market. When targeting other markets, especially in different countries, it is essential to consider the tool's compatibility with the tailored version for those markets (FGD).

Regarding the findings, like the subscription revenue model, one-time selling is a risk that should be considered when utilizing these two revenue models. This risk becomes more significant when using an outcome-based revenue model with clients who expect consistent results. However, as noted in the literature review regarding using "the amount of material excavated" [40] as a performance metric, selecting suitable performance criteria alongside the integration feature of the performance-based model can help mitigate this risk. While the development of frameworks to define, track, and verify outcomes would be beneficial, it falls outside the scope of this study. Future research could explore methodologies to address the risks of differences between expected and actual outcomes in outcome-based and performance-based revenue models. However, applying the performance-based revenue model can lead to financial risks and instability [98]. Incentives are criteria that should be considered regarding the performance-based revenue model [89], but the FGD neglected them. However, utilizing this revenue model, regarding its features, is an incentive for the clients [91].

During focus group discussions, it was mentioned that these two revenue models can provide continuous monthly and yearly income. According to the above, it is not feasible to expect the same regular income from the outcome-based revenue model as the subscription revenue model. For example, for a client such as an industrialized wooden house developer

whose revenue depends on the number of houses they sell, the income generated is not as predictable as that of the same client using the subscription revenue model.

While the alternative revenue models, including freemium, subscription, outcome-based, and performance-based, offer significant opportunities for firms to stabilize their revenue streams to better align with digitalization trends, they also present challenges and barriers, such as contract-related and execution-related issues [87], besides reliability [89]. However, balancing between risk and rewards should be considered [98]. Although the case firm in this study is an incumbent firm with access to substantial resources and thus not subject to the same financial constraints as smaller firms, risks must be carefully managed, especially regarding investment and ROI.

Adopting alternative revenue models in the construction consulting industry faces implementation barriers highlighted by focus group discussions, including high initial investment, organizational changes, and market adaptability considering target markets. One challenge is the high initial investment costs required [97] for models like subscription-based or performance-based. Smaller firms, in particular, may struggle to allocate the necessary resources for the development needed for these models. Additionally, the upfront investment costs of digitalization and continuous service delivery can pose a financial load. However, it is essential to note that these initial investments, though substantial, are manageable by the potential for stable, recurring revenue that provides long-term financial security, which alternative revenue models offer.

Insights from the focus group discussions also highlighted specific risks and challenges associated with each revenue model. For the freemium model, key challenges include the low conversion rate of free users to paying clients [19] and the financial strain of maintaining both free and premium versions, which can burden even well-resourced firms. Additionally, free tools may be perceived as less professional, reducing their attraction. In subscription models, pricing challenges, limited functionality of the tool, and the risk of clients only using the tool for a single project damage recurring revenue generation. Subscription models may also be sensitive to broader economic downturns, leading to cancellations.

Financial risks [98] and high initial costs [97] were again identified as critical challenges for outcome-based and performance-based models, particularly in setting up infrastructure to track performance outcomes and maintain client engagement. There were also concerns about accountability and regulatory observance across different markets and the unpredictable nature of revenue due to client project variability. Additionally, the firm's potential shift from a consulting focus to software provision in adopting these models may divert attention from its core business.

Lastly, the complexity of transitioning to new revenue models presents a challenge even for firms with sufficient resources. Participants from the focus groups emphasized the need for a new organization for support and development and systems to measure performance outcomes. Defining clear performance metrics, such as Rolls-Royce [94], and maintaining continuous client relationships are essential to successfully implementing outcome-based and performance-based models. While manageable with the right resources, these challenges emphasize the importance of strategic planning during the transition. Although this study admits these challenges, it is essential to note that the broader change management processes required for transitioning to new business models fall outside the scope of this research.

The study identified several target markets for this digital tool due to the importance of the client segments in revenue generation [54]. A comprehensive understanding of the diverse target markets or client segments is crucial for tailoring the revenue models to meet specific client needs and market conditions, ensuring that construction consulting firms are well-informed and prepared for the challenges ahead. However, it is possible to create a revenue model portfolio [60], targeting different markets or focusing on a select few. Because each target market should have a specific revenue model, creating a revenue model portfolio targeting different markets or focusing on a select few is possible. On the other

hand, the concept of revenue model portfolio [19,60], or mixing revenue models [81,84], was highlighted in both interviews and focus group discussions. One potential applicable scenario as a combination of revenue models is to utilize the freemium model as a demo or trial version and the subscription model as a premium version. An outcome-based option can be provided for clients looking for a customized version, while a performance-based option can be offered for clients requiring a tailored version that integrates into their system. However, the decision of other possible applicable scenarios to tailor one or multiple revenue models to a specific target market is beyond the scope of this study and can be studied in future research.

5. Conclusions

This study examines the adoption of alternative revenue models by construction consulting firms that will be a more product-based approach due to the development of digital tools. Considering alternative revenue models is crucial to address the unalignment between the shorter timeframe required for project completion using product-based tools and the current hourly-based revenue model. In a study of a digital tool, four primary revenue models, freemium, subscription, outcome-based, and performance-based, were selected and analyzed as potential alternative revenue models. By providing a framework for selecting and evaluating alternative revenue models for similar tools within the AEC industry, this study contributes to the broader discussion on business model innovation.

The freemium model offers a low barrier to entry, attracting a large user base and enhancing brand visibility. Still, it faces challenges in converting free users to paying clients and requires significant resources to support and develop it. While it can be an effective marketing tool, it risks being overshadowed by alternative free tools and has unpredictable revenue generation. The subscription model provides predictable recurring revenue and supports long-term client relationships, making it scalable and financially stable, but it demands continuous development and pricing strategies. It can be paired with other models to expand the client base, though there is a risk of limited use and sensitivity to economic downturns. The outcome-based and performance-based models align closely with client goals by tying payments to specific outcomes or performance metrics, enhancing profitability and competitive advantage. However, these models are complex to implement, require high initial costs, and depend on consistent client usage. They offer opportunities for customization, new market entry, and expanded services but also pose risks regarding accountability, financial stability, and potential shifts away from core business activities. Utilizing alternative revenue models may necessitate organizational changes.

The findings indicate that combining or adapting various revenue models can result in a diversified revenue model portfolio tailored to each tool's specifications, market segments, client needs, and the provider firm's core business. This approach, which integrates multiple revenue models instead of relying on one, allows firms to serve a broader client base, increase their revenue potential, mitigate risks, and take advantage of each revenue model's opportunities.

When considering alternative revenue models, it is essential to take specific steps into account. Firms should start by identifying an appropriate project that can be transformed into a product and automating the necessary processes to make a digital product. After evaluating their current revenue model, firms should identify possible alternative models and select the most appropriate to their digital tool and business goals. A comparison using tools like SWOT analysis will help evaluate the viability of each model. Firms should also address challenges, such as high initial costs and transitioning complexities, while considering whether a single model or a portfolio of models best serves their diverse identified target markets.

In conclusion, actors in the industry currently utilizing an hourly-based revenue model may face challenges when considering the development of digital tools, which may lead to a more product-based approach in contrast to project-based approaches. While potentially reducing project timelines, these tools can conflict with an hourly-based revenue model,

leading to concerns about the digitalization paradox and return on investment. However, the framework presented in this study offers guidance for selecting and evaluating revenue models tailored to various tools. By leveraging this framework, firms can adopt a diversified revenue model portfolio, aiding them in addressing the conflict between the shorter project durations of product-based digital tools and their hourly-based revenue model. This approach enables firms to develop digital tools while maintaining profitability and return on investment.

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