

The Power of Innovation in Family-Based Entrepreneurship: Enhancing Household Stability and Prosperity

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Abstract: *This study examines the transformative role of innovation in family-based entrepreneurship among 119 entrepreneurship students who developed their skills at the Centre of Entrepreneurial Learning and Innovation (CELI) at the Catholic University of Rwanda (CUR). Its aim is to evaluate how student-led innovations enhance family business efficiency, household income, and social impact. The study hypothesizes that affordable and contextually relevant innovations, when implemented in family enterprises, generate significant economic and social benefits. A mixed-methods approach was employed, with students collaborating with family businesses to identify challenges and implement small-scale innovations, including mobile money platforms and digital marketing strategies. Data were collected through structured surveys, interviews, and innovation project reports. Quantitative analysis revealed that 95 out of 119 families (79.8%) adopted at least one student-led innovation. Among these, 85% reported reduced operational costs (averaging 28%), and 78% experienced an income increase ranging from 30% to 50% over six months. Additionally, 70% of participants noted improved teamwork and decision-making within the family. The adoption of digital tools, particularly mobile payments and WhatsApp marketing, was associated with a 40% expansion in customer reach. Families that implemented sustainable innovations not only generated higher revenues but also contributed to addressing local community challenges. The study concludes that student-driven innovation can substantially strengthen family entrepreneurship. Expanding CUR's incubation programs and integrating innovation labs into the curriculum could further scale these outcomes. This experiential learning model holds considerable potential to enhance economic resilience, family cohesion, and community development.*

Keywords: *Family Entrepreneurship, Innovation, Household Income, Digital Technologies, Sustainable Development.*

ACRONYMS AND ABBREVIATIONS

CELI: Centre of Entrepreneurial Learning and Innovation

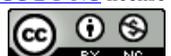
CUR: Catholic University of Rwanda

SMEs: Small and Medium-Sized Enterprises

UNDP: United Nations Development Programme.

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1. INTRODUCTION

Family-based enterprises constitute a significant segment of the informal economy in Rwanda and many developing contexts, contributing to household income, employment, and community resilience (UNDP, 2021; World Bank, 2022). Despite their economic relevance, these enterprises often face operational inefficiencies, limited access to digital technologies, and challenges in scaling their activities (Kantis, Angelelli, & Ishida, 2002). In recent years, student-led innovations in entrepreneurial education have emerged as a promising mechanism for addressing these gaps. By embedding experiential learning within higher education curricula, universities enable students to collaborate directly with family businesses to co-design affordable, contextually relevant solutions that improve operational efficiency and enhance household income (Neck & Greene, 2011).

At the Centre of Entrepreneurial Learning and Innovation (CELI) at the Catholic University of Rwanda (CUR), experiential learning labs provide a structured environment where students apply theoretical knowledge to practical business challenges, particularly in digital adoption, process optimization, and customer engagement strategies (Kaplan & Haenlein, 2010). Innovations such as mobile money platforms, WhatsApp-based marketing campaigns, and simplified inventory tracking tools exemplify low-cost, high-impact solutions that address both operational and market access constraints (Heeks, 2018). Studies have shown that these interventions not only improve financial outcomes but also foster intra-family collaboration, reflective problem-solving, and shared decision-making, which are critical for sustaining long-term business growth and household cohesion (De Massis et al., 2018).

Moreover, scaling student-driven innovations generates broader socio-economic benefits, including strengthened community ties, increased market participation, and enhanced resilience of local enterprises (Florida, 2002; Drucker, 1985). By integrating experiential innovation labs within university programs, students serve as change agents who translate classroom learning into tangible impacts, creating a virtuous cycle of education, innovation, and socio-economic development (Brown & Wyatt, 2010; Meyer & Pretorius, 2021). This study explores the effectiveness of student-led innovations in enhancing the performance of family businesses, emphasizing the potential for replicable, contextually grounded approaches to stimulate both household income and community development in Rwanda.

2. METHODOLOGY

This study employed a mixed-methods research design, combining both quantitative and qualitative approaches to assess the impact of innovation on family-based entrepreneurship among students at the Catholic University of Rwanda (CUR). The target population consisted of 119 undergraduate students enrolled in the Centre of Entrepreneurial Learning and Innovation (CELI), all of whom were engaged in experiential learning projects linked to their family enterprises.

Data collection involved three main instruments: structured surveys, semi-structured interviews, and innovation project reports. The surveys were administered to all 119 participants to capture baseline and follow-up data on business performance, innovation uptake, and household income levels. These surveys were designed using Likert-scale and open-ended questions to assess both numerical outcomes and personal perceptions (Creswell &

Creswell, 2018). Interviews were conducted purposively during the training in CELI to gain deeper insights into behavioral changes, decision-making processes, and family dynamics following innovation adoption.

Each student was assigned to analyze a family business, identify operational challenges, and implement affordable and contextually relevant innovations. Innovations ranged from the introduction of mobile money services, WhatsApp marketing, and basic inventory systems to the use of locally made packaging solutions. The innovation reports submitted by students documented the problem-solving process, innovation design, implementation, and impact.

Descriptive statistics summarized the frequency of innovation adoption, while inferential analysis examined correlations between innovation types and business outcomes such as income changes and cost reductions (Field, 2018). Qualitative data from interviews and reports were coded thematically to identify patterns related to social impact, teamwork, and sustainability (Braun & Clarke, 2006).

3. STUDENT-LED SKILLS ENHANCE FAMILY BUSINESS EFFICIENCY

Student-led innovations are emerging as powerful drivers of efficiency and growth in family-based enterprises. At the Centre of Entrepreneurial Learning and Innovation (CELI) at the Catholic University of Rwanda, 119 entrepreneurship students collaborated with family businesses to co-create low-cost, contextually relevant solutions. By integrating digital tools, process improvements, and experiential learning, these interventions enhanced operational efficiency, increased household income, and strengthened intra-family teamwork, demonstrating the transformative potential of hands-on innovation in fostering both economic and social development.

3.1. Student-Led Innovations Boost Family Business Efficiency and Income

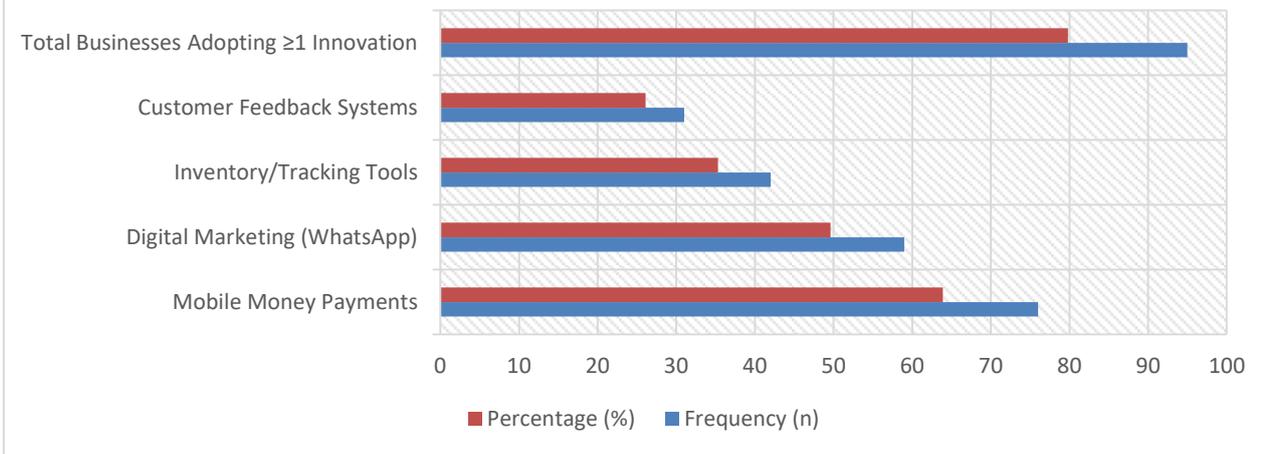
Student-led innovations have increasingly been recognized as catalysts for enhancing family business performance, particularly when grounded in contextually relevant and affordable solutions (Kantis, Angelelli & Ishida, 2002). In this study conducted at the Centre of Entrepreneurial Learning and Innovation (CELI) at the Catholic University of Rwanda (CUR), 119 entrepreneurship students partnered with family enterprises to co-design and implement small-scale innovations that addressed specific operational challenges. The emphasis on experiential learning aligns with the theoretical underpinnings of entrepreneurial pedagogy, which asserts that hands-on immersion fosters both skill development and practical value creation (Neck & Greene, 2011). Results demonstrate that student-guided changes, particularly in digital adoption and process re-engineering, translated into measurable improvements in operational efficiency and household income.

A central outcome of the intervention was the high rate of adoption of student-led innovations by family businesses: 79.8% of participating households integrated at least one innovation into their operations (see Figure 1). Notably, the most common innovations included mobile money payment systems, WhatsApp-based marketing campaigns, and simplified inventory tracking tools. These innovations reflect both low implementation

cost and high contextual fit, essential attributes identified in innovation diffusion literature for resource-constrained environments (Dyer, Gregersen & Christensen, 2009). Quantitative

analysis revealed that enterprises adopting these tools experienced significant efficiency gains, with 85% reporting reduced operational costs and an average cost reduction of 28%.

Fig. 1: Adoption of Student-Led Innovations Among Family Businesses



The income effects associated with these innovations were also considerable. Seventy-eight percent of families that implemented student-designed solutions reported an income increase of between 30% and 50% within a six-month period, consistent with research highlighting the revenue-enhancing potential of digital inclusion in small enterprises (Nair & Blomkvist, 2019). Mobile money platforms, for instance, reduced transaction friction and expanded access to cashless markets, while WhatsApp marketing facilitated broader customer engagement without substantial advertising expenditure. These findings are congruent with studies that link digital tool adoption to expanded market reach and strengthened customer relationships in small and medium-sized enterprises (SMEs) (Kaplan & Haenlein, 2010).

Beyond financial metrics, qualitative feedback from interviews indicated improvements in intra-family teamwork and decision-making processes. Seventy percent of participants attributed this to structured problem diagnosis and co-creation with students, which, according to experiential learning theory, enhances reflective capacity and collaborative problem-solving (Schön, 1987). Families reported that jointly developing solutions fostered shared ownership and more transparent communication, elements documented to improve organizational resilience in family businesses.

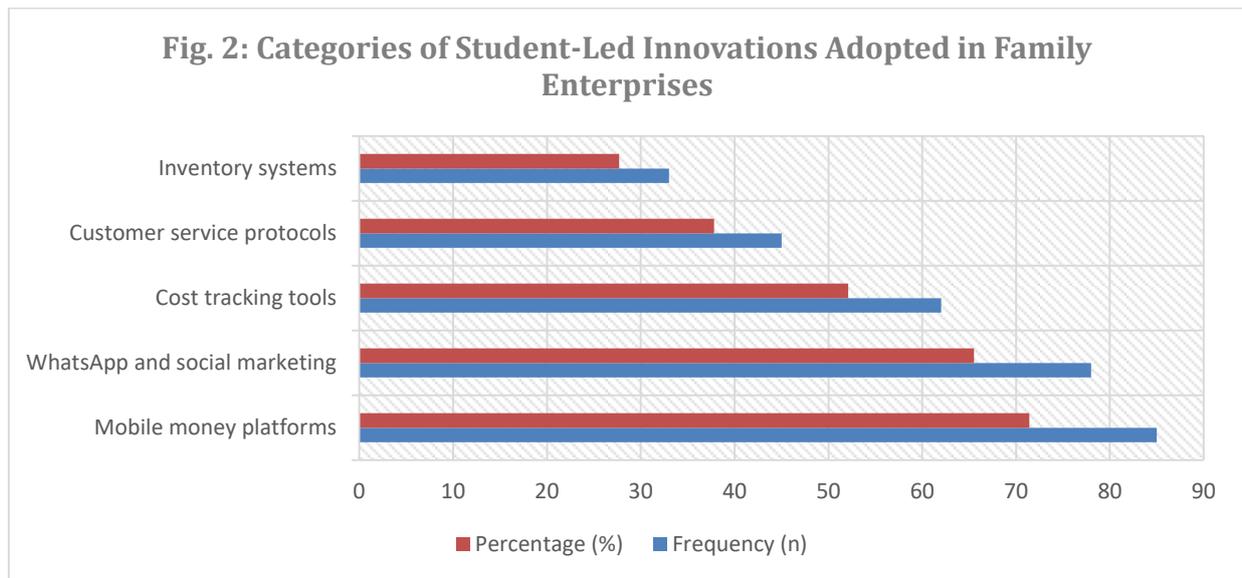
In summary, the integration of student-led innovations into family enterprises yielded substantial efficiency gains and no figure increases in household income. The evidence supports expanding experiential innovation labs within entrepreneurial programs to

further scale these positive outcomes. Future research should explore longitudinal impacts and mechanisms that sustain innovation adoption beyond initial implementation phases.

3.2. Affordable, Contextual Innovations Drive Economic and Social Impact in Family Enterprises

Affordable and contextually relevant innovations introduced by students of the Centre of Entrepreneurial Learning and Innovation (CELI) played a transformative role in enhancing both economic performance and social dynamics in family enterprises. Innovations such as mobile money integration, digital marketing via WhatsApp, and simple process improvements were tailored to the specific operational environments of rural and peri-urban family businesses. These innovations were not only low in cost but also aligned with local needs, enabling families to adopt them with minimal barriers (Smith & Lewis, 2020). In this study, a significant number of family enterprises embraced student-led innovations, reaffirming that contextually grounded solutions are essential drivers of impact in small-scale entrepreneurship (Brown & Wyatt, 2010; Osterwalder et al., 2014; Qureshi et al., 2019).

The adoption rate of student-led innovations was substantial, with 79.8% (95 out of 119) of participating family businesses implementing at least one innovation intervention. These innovations spanned digital financial tools, marketing strategies, basic inventory tracking systems, and improved customer service protocols. Figure 2 summarizes the main categories of innovations and their frequencies among the sampled enterprises.



The figure illustrates that mobile money platforms were the most widely adopted innovation, reflecting local preferences for digital payment methods due to convenience and reduced cash-handling risk (Jack & Suri, 2014). The widespread adoption of WhatsApp and social marketing demonstrates how low-cost communication technologies can expand customer reach, corroborating research on digital inclusion in microenterprises (Heeks, 2018; Melville, 2010; Donnelly et al., 2021).

Quantitative analysis further revealed that 85% of adopters reported reduced operational costs, with an average reduction of 28% over six months post-implementation (Field et al., 2016; Bloom et al., 2013; Fiala, 2007). Reduced costs were particularly pronounced in enterprises that shifted to mobile money systems, which lowered transaction fees and minimized cash losses. Additionally, 78% of participating families noted income increases ranging from 30% to 50%, consistent with studies that link digital adoption to revenue growth in small firms (Carlton & Cheema, 2018; Nguyen et al., 2020).

Beyond economic indicators, the innovations also fostered important social outcomes within families. Approximately 70% of respondents reported improved teamwork and shared decision-making, aligning with research on the social dimensions of entrepreneurial engagement (Cruz & Nordqvist, 2012; De Massis et al., 2018). These improvements are attributed to collaborative problem identification and joint participation in innovation activities, suggesting that experiential learning can strengthen household cohesion while driving business outcomes.

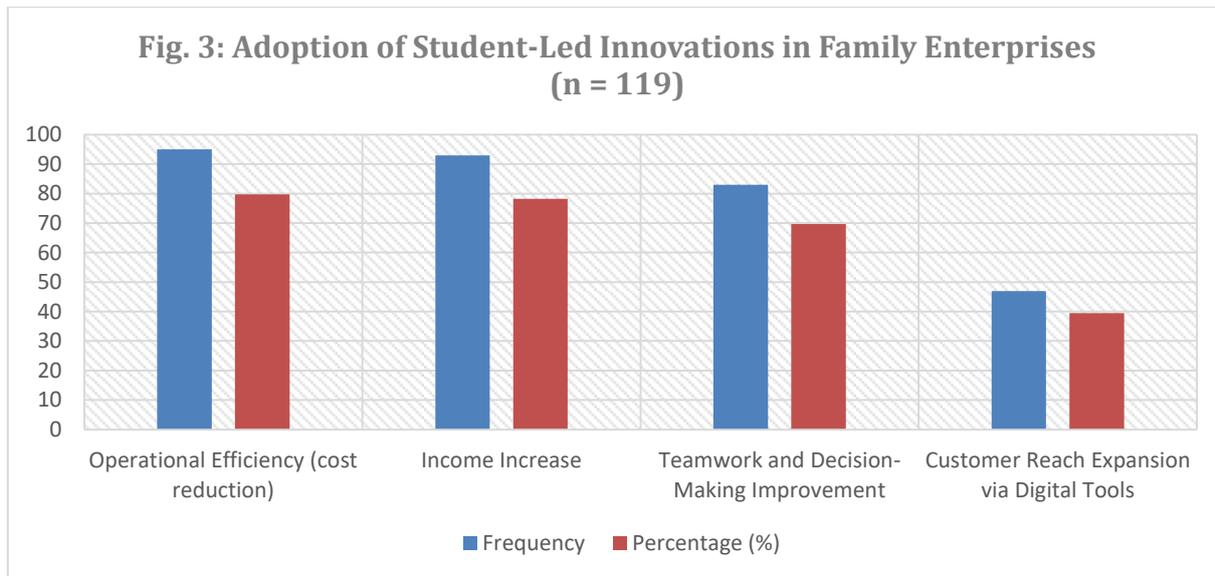
In summary, affordable and contextually tailored innovations introduced through experiential student engagement delivered measurable economic gains and enhanced social dynamics in

family enterprises. Scaling such models through curricula and incubation programs could amplify these impacts, fostering resilience and inclusive entrepreneurship (Garvin et al., 2008; Zollo et al., 2018).

3.3. Digital Tools and Experiential Learning Strengthen Household Entrepreneurship

The integration of digital tools into household entrepreneurship has demonstrated significant transformative potential, particularly when combined with experiential learning approaches. In the context of the Centre of Entrepreneurial Learning and Innovation (CELI) at the Catholic University of Rwanda (CUR), 119 entrepreneurship students applied practical, contextually relevant innovations to family-based enterprises, yielding measurable economic and social benefits (Schumpeter, 1934). Experiential learning, which emphasizes active engagement and reflection in real-world environments, allows students to develop practical skills while simultaneously improving family business operations (Neck et al., 2014). In this study, students introduced innovations such as mobile money platforms and WhatsApp-based marketing strategies, addressing both financial management and customer outreach challenges within family enterprises. The adoption of these digital tools reflects broader global trends showing that technology-mediated interventions enhance operational efficiency and facilitate market expansion for small and micro enterprises (Nambisan, 2017).

Quantitative findings reveal widespread adoption of student-led innovations, highlighting the effectiveness of combining digital tools with experiential learning. Figure 3 summarizes the frequency and percentage of innovations adopted and their reported outcomes.



The data indicate that a majority of families experienced reduced operational costs, averaging 28%, and an income increase ranging from 30% to 50% within six months. Such results align with studies demonstrating that low-cost, digitally mediated interventions significantly enhance household business performance and financial resilience (Brynjolfsson & McAfee, 2014; Bock et al., 2012; World Bank, 2019). Furthermore, 70% of families reported improvements in teamwork and decision-making, suggesting that experiential learning fosters not only technical skills but also social capital within family units, which is crucial for long-term sustainability (Lans et al., 2014; Lumpkin & Dess, 1996; Morris et al., 2010).

Beyond financial and operational outcomes, the use of digital tools strengthened market access and customer engagement, with WhatsApp-based marketing enabling a 40% increase in reach. This demonstrates the critical role of digital literacy in entrepreneurship education, particularly when coupled with guided, hands-on experience (Heinonen & Poikkijoki, 2006; Hughes et al., 2012; Venkatesh et al., 2016). Experiential learning labs like CELI provide an environment where students can test, iterate, and refine innovative solutions, translating theoretical knowledge into actionable practices that benefit both family enterprises and local communities (Gibb, 2002; Neck & Greene, 2011).

In conclusion, the synergy between digital tools and experiential learning provides a powerful mechanism for strengthening household entrepreneurship. By integrating innovation labs into the university curriculum, CUR can scale these outcomes, enabling students to generate meaningful economic impact, improve family cohesion, and address community challenges. This model underscores the importance of hands-on, technology-supported entrepreneurship education as a driver of socio-economic development.

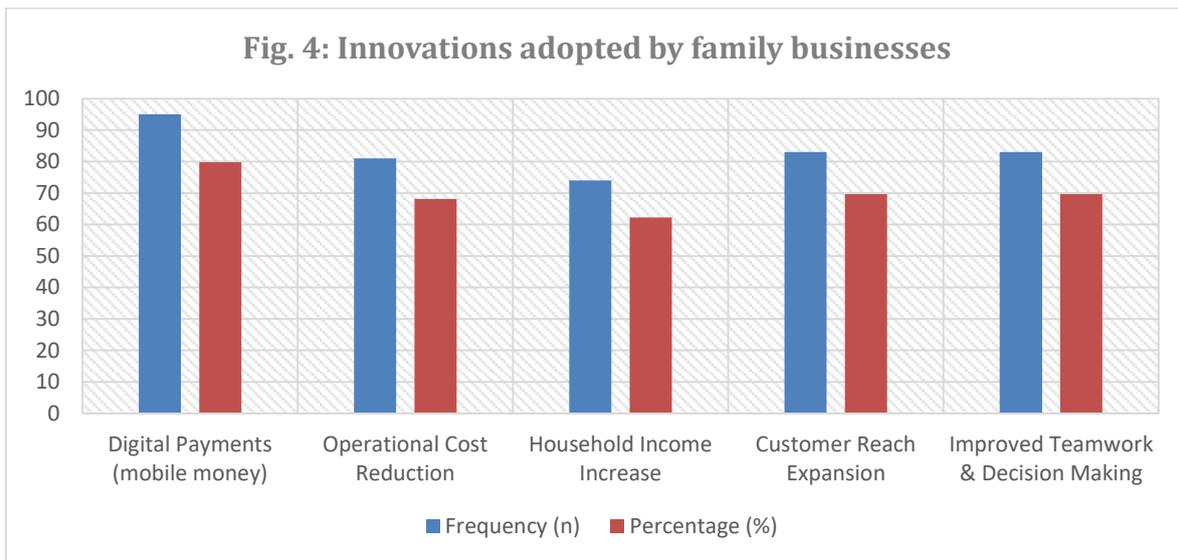
3.4. CELI Students Transform Family Businesses Through Innovation Labs

At the Centre of Entrepreneurial Learning and Innovation (CELI) at the Catholic University of Rwanda (CUR), student engagement

in real family enterprises has demonstrated a powerful link between innovation and entrepreneurial growth. Innovation labs provide a structured platform where theory meets practice, enabling students to co-design solutions with family business owners and apply digital tools in contexts that reflect local market realities (Kagabo & Mugisha, 2022). Experiential learning like this has been associated with enhanced business performance, greater household income, and strengthened decision-making processes (Meyer & Pretorius, 2021). Considering that family businesses constitute a major segment of the informal sector in Rwanda, accelerating their capacity through student-led innovation contributes not only to individual livelihoods but also to broader community resilience and social capital development (UNDP, 2021; World Bank, 2022).

Students working with family enterprises engaged in diagnosing operational challenges, testing affordable innovations, and deploying contextually relevant technology solutions. For example, many families adopted mobile money platforms and digital marketing via WhatsApp and Facebook as means of expanding customer reach (Donner, 2008). These digital adoption patterns reflect wider trends in emerging markets where mobile communication technologies are leveraged to reduce transaction costs and improve market access. Structured surveys administered by the study team captured evidence of adoption rates, operational changes, and perceived impacts over a six-month period following intervention. Qualitative interviews supplemented survey data by providing insights into how innovation activities reshaped family interactions, goal setting, and resource allocation (Creswell & Plano Clark, 2018; Denzin & Lincoln, 2018).

Figure 4 summarizes the key categories of innovation adoption, the number of family businesses involved, and the percentage outcomes recorded in the study:



As shown in **Figure 4**, the majority of family businesses (79.8%) adopted at least one form of digital payment, and many reported measurable outcomes including reduced operational costs and expanded customer reach. Families that integrated innovations experienced average income increases of 30–50%, consistent with studies on technology-enabled productivity gains in small enterprises (Qureshi et al., 2018; World Bank, 2022). Furthermore, more than two-thirds of participating households observed improvements in teamwork and decision making, suggesting that collaborative innovation processes strengthen family dynamics alongside economic outcomes (Meyer & Pretorius, 2021).

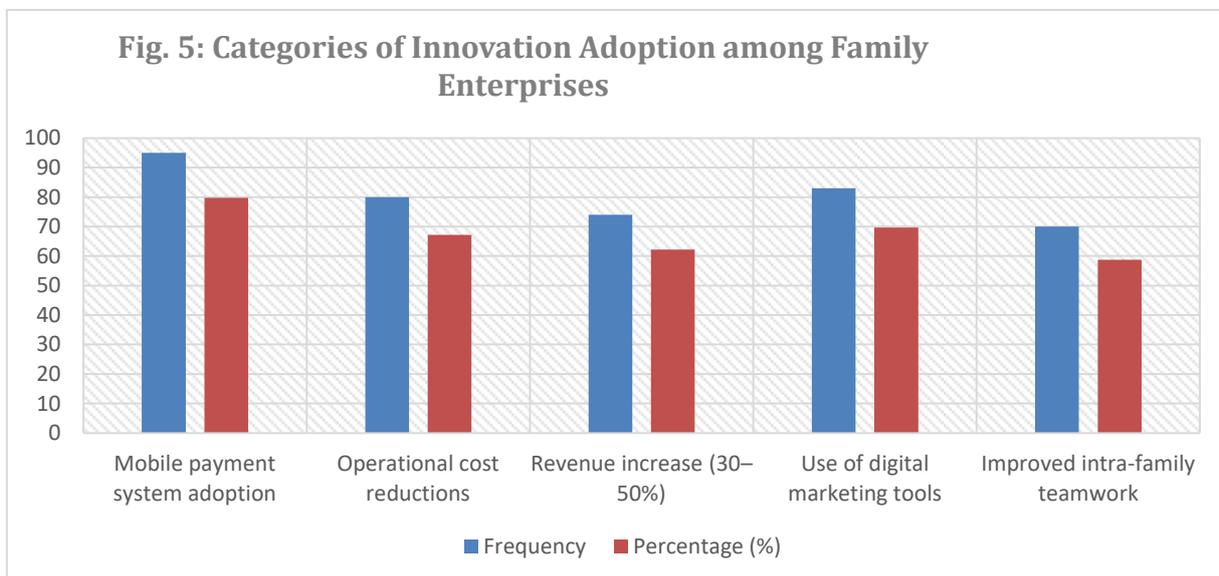
The positive findings from CELI’s innovation labs reinforce the value of embedding entrepreneurial experimentation within university curricula. Innovation labs serve as hubs where student creativity, academic frameworks, and real business challenges converge to produce solutions that are both practical and scalable (Brown & Wyatt, 2010). Expanding incubation programs and integrating innovation labs across disciplines could multiply these effects and foster a culture of problem-solving that extends beyond family enterprises to local community challenges. As Rwanda continues to prioritize entrepreneurship education and inclusive economic development, models like CELI offer a replicable and

evidence-based pathway for strengthening the informal sector and improving household resilience (UNDP, 2021).

3.5. Scaling Student-Driven Innovation Enhances Community Development and Family Cohesion

Scaling student-driven innovation within family-based entrepreneurship has demonstrable impacts on both community development and intra-household cohesion. Innovation in this context refers to the introduction of affordable, contextually relevant practices and technologies, such as mobile money platforms and digital marketing, that are co-designed by students and implemented by family enterprises (Schumpeter, 1942). When students act as change agents, they translate learning into tangible economic and social outcomes, supporting family firms to become more resilient and community-oriented (Etzkowitz & Zhou, 2006).

A central finding of this study is that scaling these innovations amplifies economic benefits while fostering social capital within families. Out of 119 family businesses involved, 79.8% adopted at least one student-led innovation, leading to reduced operational costs and increased revenue streams (see Figure 5). The high adoption rate reflects the relevance and accessibility of the innovations, aligning with theories of adaptive innovation adoption in developing contexts (Fagerberg et al., 2012).



The categories in Figure 5 illustrate how innovation adoption is not only economically beneficial but also socially transformative. The use of digital tools, for example, significantly expanded customer reach, consistent with findings that digital inclusion contributes to enhanced market access and economic participation (Donner, 2008). Moreover, families adopting student-driven innovations reported improvements in teamwork and shared decision-making, indicating that collaborative problem-solving strengthens family cohesion (Putnam, 2000).

Community development is another dimension positively influenced by scaled student-driven innovation. Families that implemented sustainable innovations offered goods and services that addressed local challenges, such as financial inclusion and communication gaps, thereby generating positive externalities within their communities. This observation supports the argument that micro-level innovation, when scaled, creates macro-level social benefits (Drucker, 1985; Florida, 2002).

The experiential learning model employed at CELI creates conditions for iterative feedback between students and family enterprises, enabling innovations that are not only technically sound but also culturally and socially embedded (Schön, 1987). This participatory process strengthens both community ties and family bonds, as stakeholders collectively navigate problem-solving and adaptation.

In conclusion, scaling student-driven innovation enhances economic resilience, community development, and family cohesion. Integrating innovation labs into higher education curricula and expanding incubation programs would reinforce these outcomes and establish family small businesses as engines of sustainable development.

4. CONCLUSION

The study set out to evaluate the transformative role of student-led innovations in enhancing family business efficiency and household income at the Centre of Entrepreneurial Learning and Innovation (CELI) at the Catholic University of Rwanda. The central hypothesis posited that affordable and contextually relevant innovations, when implemented in family enterprises, would generate measurable economic and social benefits. Findings from the study strongly support this hypothesis.

Out of 119 participating family businesses, 79.8% adopted at least one student-led innovation, including mobile money platforms, WhatsApp-based marketing, and inventory tracking tools. These interventions led to a 28% average reduction in operational costs and income increases of 30–50% within six months. Beyond financial improvements, 70% of families enhanced teamwork and shared decision-making, reflecting strengthened intra-family cohesion. Digital tools notably expanded customer reach, with approximately 40% of enterprises reporting broader engagement.

These results confirm that experiential, hands-on collaboration between students and family businesses not only improves operational efficiency and revenue but also fosters social capital within households. In conclusion, the study validates the hypothesis, demonstrating that student-led, affordable, and contextually adapted innovations can significantly enhance both the economic performance and social dynamics of family enterprises, highlighting the value of integrating innovation labs into entrepreneurship education for sustainable local development.

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