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Process innovation in credit unions: Evidence from Ireland, Scotland, Northern Ireland, and Ghana

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Topic: Process innovation in credit unions: Evidence from Ireland, Scotland, Northern Ireland, and Ghana.

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Abstract

Credit unions are community financial institutions existed mainly to provide financial services to their members. Credit unions have an impact on local economies that is estimated to be US\$192 billion, of which US\$117 billion is value added. Members of credit unions save about US\$10.2 billion each year from lower fees and better interest rates relative to what they would be charged by other financial service providers. The first innovation in the credit union sector happened in 1900 when the sector in Canada became the first financial institutions to provide ownership and membership to all customers, as well as providing the first personal loan based on a borrower's character. These have been regarded process innovations, and process innovation have been found to lower operational costs, simplify processes, bring about faster cycle times and better utilise assets in organisations. However, few studies have directly examined innovation in these organisations, and little is understood about the types of processes that credit unions have undertaken to provide turn around and relevant services to their members and potential members. To address the gap, we survey innovation in credit unions across four countries. We found that deregulation of the sector is key for the sector innovation in terms of growth and development from a nascent industry to mature industry, where sophisticated financial products are provided to consumers and communities. Additionally, process innovation provided stimulus for operational and structural innovations that has in turn enhanced products and services delivery in these organisations.

Key words: credit unions, process innovation, structural innovation, administrative innovation, operational innovation, and marketing innovation.

Introduction

Credit unions typically provide credit and financial service products to personal customers, although some also provide credit and financial services to local businesses (Magdalena and Martin, 2016). According to the World Bank, credit unions have an impact on local economies that is estimated to be US\$192 billion, of which US\$117 billion is value added (Van, 2017). In addition, it is estimated that credit union members save about US\$10.2 billion each year from lower fees and better interest rates relative to what they would be charged by other financial service providers (Van, 2017; Virgilio et al, 2022). Moreover, it is estimated that the competitive pressure exerted by credit unions forces banks to pay higher rates for deposits and charge lower rates for loans, thereby saving non-members US\$4 billion (Van, 2017). Finally, credit unions are also responsible for non-financial

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benefits, for example, 85 per cent of members have access to financial education, and credit unions are considered to offer their members a better customer service than banks (Mook et al., 2014; Van, 2017).

Credit unions remain important institutions, providing financial services in areas that might otherwise be underserved or remain without financial services (Kalmi, 2016). Whilst commercial banks focus on big towns and cities, credit unions provide services in rural towns and villages (Kalmi, 2016; Johan and Sari, 2023). The important role credit unions play within communities has been recognised, and local authorities and the UK government have been called upon to support credit unions, to enable them to increase their reach through innovation (Alistair et al., 2020; Carnegie UK Trust, 2016).

Overall, innovation is seen as necessary for sustainability as it helps credit unions remain competitive by improving service provision (ABCUL, 2016, Bruno da Rocha, 2020; Sinclair, 2014). Moreover, the recent COVID-19 pandemic has highlighted the need to have financial systems in place to serve members when branches are forced to close. The financial crisis and the COVID-19 pandemic were not predictable, they highlighted that credit unions need to be versatile and to adapt quickly to their environment to survive and prosper. Therefore, sustainability of the credit union sector is dependent on innovation. Yet, despite being important to organisational development and sustainability, little is reported in the literature on innovation in credit unions (Ferguson and McKillop, 1997; Jones, 2016; McCarthy et al, 2016; McKillop et al, 2006; McKillop and Wilson, 2011; McKillop and Quinn, 2012; McKillop and Quinn, 2015). Therefore, the aim of this study is to investigate innovation in credit unions focusing on process innovation in terms of operational, structural and administrative innovations.

Credit unions studies have examined the adoption of technology in this sector, such as internet banking (Dow Jr, 2007; McKillop and Quinn, 2012), as well as the adoption of web or ICT services (Damar and Hunnicutt, 2010; McKillop and Quinn, 2015; Pana et al., 2015; Weigelt and Sarkar, 2009). In addition, references are made to the importance of innovation and the need for innovative products in online reports (Brat et al., 2016; Hofheimer et al., 2014), CUNA's newsletters, credit union magazines and credit union newsletters (Mertz et al., 2015), and professional publications (WOCCU, 2004). Although product and service innovations have recently been studied (Musah et al, 2022), to our knowledge no study has explicitly examined process innovation in credit unions.

We make three contributions to the literature. Previous studies regarding innovation strongly suggest that innovations in the financial services sector are mostly intangible, making it difficult to identify (Litan, 2010; Mention and Marko, 2012; Mention and Torkkeli, 2014). Therefore, our first theoretical contribution is to adapt the dimensions of innovation framework (Crossan and Apaydin, 2010) in the for-profit sector to identify and differentiate between categories of innovation in the credit union sector (See Appendix 1). The second contribution is also theoretical. The study contributes to the endogenous growth theory (Coe and Helpman, 1995; Dungey and Volkov, 2018; Perez-Sebastian, 2015), which suggests that credit union R&D, in terms of innovation is influenced by national regulation evidenced in this study by structural innovation.

The final empirical contribution is that it is the first study to explicitly identified different types of process innovations in credit unions. Processes innovations are said to be mechanism deployed by organisations in order to lower direct costs, simplify processes, bring about faster cycle times and better utilise organisations' assets (Hammer, 2004).

The paper is structured as follows. The dimension of innovation model is detailed in the next section, followed by the data and methodology, findings and discussion and conclusions of the study.

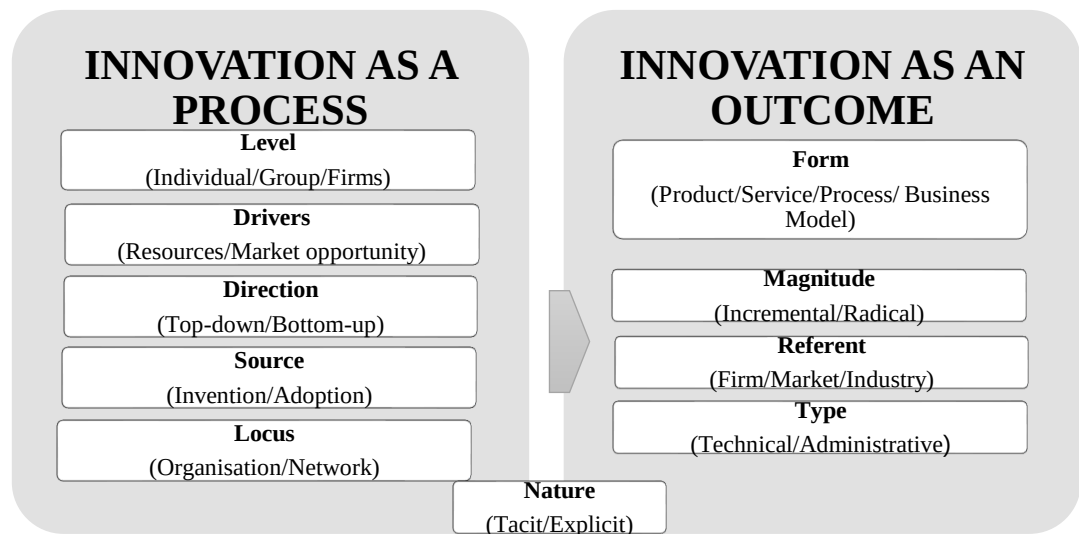
The conceptual framework: Dimensions of innovation

O’Sullivan and Dooley (2008), define innovation as “the process of making changes; either large or small, radical or incremental to products, processes and services, that results in the introduction of something new for the organization that adds value to customers and contributes to the knowledge store of the organization” (p.5). In the context of credit unions, scholars defined innovation as “The implementation of new, improved and value-adding products, services or processes by the credit union, with the aim of fulfilling the financial service requirements of their membership and potential membership, and if possible generating benefits for the community” (Musah et al, 2022, p. 5).

Innovations vary widely in nature, degree and novelty (Tidd and Bessant, 2009; Snihur and Wiklund, 2019). Scholars in the field of organisational sociology, economics, management and technology use the dimensions of innovation to conceptualise innovation (Gopalakrishnan and Damanpour, 1997). However, what constitute dimensions of innovation varied in its classification. For example, Malerba (2005) classified the dimensions of innovation as differentiation across sectors, sources, characteristics, actors involved, boundaries of the innovation process and how innovation is carried out in organisations. Morris (2013) identified innovation into three dimensions: incremental, breakthrough and business model. Garcia and Calantone (2002) classified the dimensions of innovation into either radical or incremental. And based on innovation form, Tidd and Bessant (2018b) categorised innovation into four dimensions: position innovation, product innovation, process innovation and paradigm innovation.

However, this study uses the innovation framework from Crossan and Apaydin (2010) to conceptualise innovation in the context of the credit union sector. Dodgson et al. (2014) assert that this framework is the most comprehensive to date. The framework classifies ten dimensions of innovation into two categories: innovation as a process and innovation as an outcome (Figure 1).

Figure 1. Dimensions of innovation framework



Source: Adapted from Crossan and Apaydin (2010, p.1167).

Innovation form

This paper focuses on the form dimension of innovation. This is made up of product/service, process and Business Model Innovations (Crossan and Apaydin, 2010). Whilst products, services and business model innovations are discussed at length in the literature, this study is limited to process innovation in credit unions. These are discussed in the next sections.

Process innovation: This involves innovation in an organisation's production processes, such as task specifications and work and information flow mechanisms in organisations (Gopalakrishnan and Damanpour, 1997). Process innovation is important for organisational development because it leads to an improvement in the quality and efficiency of organisations' external and internal processes (Walker 2014). According to Salter and Alexy (2014), process innovations are typically hidden from the public view, and involve changes to production methods, work schedules, administrative methods, working procedures, operations, and technology that can be depended on to improve service delivery (Crossan and Apaydin, 2010). Process innovation is the focus of this study.

Product innovation: Hannigan et al., (2018) and Tidd and Bessant, (2018b), state that product innovations are new products introduced by organisations in order to meet the demand of customers or users of a particular product or service. Salter and Alexy, (2014) identified that product innovations are easy to differentiate from existing products in the market, because they are different to the other products on the market (Crossan and Apaydin, 2010). Product innovation is not investigated in this study.

Service Innovation: Typically, service innovation relates to service organisations and is defined as new development activities that deliver core business services to customers (Oke, 2007). They arise when service organisations need to make their core business services more attractive to their consumer base or seek to increase their market share (Oke, 2007). Service innovation is not investigated in this study.

Business Model Innovations (BMIs): Despite being identified as a separate form of innovation by Crossan and Apaydin, (2010), the concept of BMI as a separate innovation outcome is contested as it is unclear whether BMI can be differentiated from business strategy (Perkmann and Spicer, 2010). BMI is also difficult to differentiate and measure in a real-world situation (Tidd and Bessant, 2018a). In view of this, BMI as a separate form of innovation has not been investigated in the context of credit union innovation.

Methodology

Survey process

This study uses survey in 2018 to gather data on the process innovations in credit unions from four different countries: Northern Ireland, the Republic of Ireland, Scotland and Ghana to create a dataset. Quantitative content analysis was undertaken to identify process innovations existence in credit unions. A checklist was created and then incorporated into the survey to enable data collection from the four countries. A survey

questionnaire is a self-reporting instrument that is completed by sample respondents (Johnson and Turner, 2003; Saunders et al., 2016) and has a number of advantages. It can reach a wide population and address a range of different topics such as the types of new processes undertaken by an organisation (Nardi, 2014). However, surveys also have limitations. For example, low return rates can be recorded, which may affect generalisability. There is also the possibility of incorrect or missing answers from respondents (Johnson and Turner, 2003; Nardi, 2014). Furthermore, answers to relevant questions could be exaggerated by the respondent (Oppenheim, 1992; Taheri et al., 2015).

To help address some of these biases, the researchers carefully gave consideration to the wording of individual questions. Explanations were also provided on why each piece of data is required (Oppenheim, 1992; Saunders et al. 2016). Furthermore, we piloted the survey in Northern Ireland and amended according to the feedback received (Johnson and Turner, 2003). By following these steps, and triangulation of data, as well as carefully designing the study bias was minimised (Johnson and Turner; 2003; Oppenheim, 1992; Saunders et al, 2016).

Most of the questions in the survey were closed-ended and served to determine if the credit union had implemented any of the process identified from the literature, websites of credit unions, trade associations and various credit union reports. Open-ended questions were also used in the survey. This allows for information not identified from the literature and content analysis of the credit union reports and websites. This is regarded as an optimal approach to discover new results for a study (Nardi, 2014; Krosnick and Presser, 2018; Basias and Pollalis, 2018). The respondents were also asked to highlight if the implementation had taken place in the last five years. Five years period was chosen because there is no agreed number of years in the literature regarding innovation data reporting from organisations. For example, studies used two to five years (Hristov and Reynolds 2015; Oke, 2007); however, considering the non-profit nature of credit unions and the financial constraints they face, five years was deemed to reflect recent innovation activity.

Survey context

Consistent with the credit unions development framework (Ferguson and McKillop, 1997; McKillop and Wilson, 2015), four countries have been chosen for this study. The development and growth of credit unions within countries and across the globe have been categorised into three: nascent, transition and mature (Ferguson and McKillop, 1997; McKillop and Wilson, 2015). Nascent credit unions are largely located in Africa, transitional ones are found in Europe including the UK and Ireland, whilst the mature credit unions are in North America, South Korea and Australia. In the context of this study, Ferguson and McKillop (1997) and McKillop and Wilson (2015) identified credit unions in Ghana to belong to the nascent sector, those in Northern Ireland and Scotland are grouped into transitional sectors. Recently, credit unions in Ireland have attained a mature phase of development (Hyndman and McKillop, 2018). At the nascent stage, such as the sector in Ghana, credit unions provide basic products and services, unsophisticated, and are typically made up of a large number of small credit unions (McKillop and Wilson, 2015). Credit unions considered to be at the transition phase of development continuum have typically larger sized credit unions. They have an advantage over smaller credit unions in terms of regulatory burden (costs associated with regulation), due to economies of scale (Ferri and Kalmi, 2014). Consistent with Ireland, credit unions' sector at the mature phase are deregulated, have large assets size, and the services provided are comparable to commercial banks (McKillop and Wilson, 2015).

Survey response

This study adopted census for small population sampling strategy (Israel et al, 1992). By this approach, the entire population of credit unions in all the four countries were invited to take part in the survey. The total population and response statistics are included in Table 1.

Table 1. Survey response from Northern Ireland, the Republic of Ireland, Scotland and Ghana

Country	Number of CUs	Data collection techniques				Population response rate (%)	% of total sample in study
		Face-to-face survey	Postal survey	Online survey	Total		
Northern Ireland	148	N/A	14	31	45	30.40%	45(28.5%)
Republic of Ireland	269	N/A	19	26	45	16.72%	45(28.5%)
Scotland	96	N/A	14	13	27	28.13%	27(17.1%)
Ghana	431	11	18	12	41	9.51%	41(25.9%)
<i>Total</i>	944	11	65	82	158	16.74%	158(100%)

A total of 171 credit unions responded to the survey over the period. However, after omitting uncompleted online surveys (six in number), empty postal returns (two) and postal returns that were difficult to identify (five) because of missing credit union names, 158 responses remained valid. This represents 16.74% of the total population of 944 credit unions. The response rate for Northern Ireland was 30.40%, the Republic of Ireland 16.72%, Scotland 28.13% and Ghana 9.51%. The number was sufficient for univariate analysis (Goth et al., 2012; Psomas et al, 2018). Each valid response had 166 variables and were coded manually and imputed into SPSS 25 for analysis. Nonresponse bias is a potential problem in this study due to the low return rates from Ghana, 9.51% and the Republic of Ireland, 16.72%. However, when compared with the response rate in other multi-country studies, our response rate was acceptable for univariate analysis. For instance, Goth et al (2012) studied corporate governance in Canadian and US credit unions, obtaining an overall rate of 11.20%, and a rate as low as 6.14% for US credit unions. Similarly, a study of regulatory burdens within the Canadian and US credit union sectors obtained a response rate of about 15% for Canada, and 1% for the US (Ferri and Kalmi, 2014). It has been noted that surveys of top managers, including CEOs and directors of organisations, often suffer from low response rates (Pettigrew, 1992; Zona et al., 2013).

Results

Process innovation in credit unions

In this study, process innovations are categorised into four types. These are structural innovations, administrative innovations, operational innovations and marketing innovations. Finding details of the prevalence of each process type are now outlined.

Structural innovations

A structural innovation captures alterations in an organisation's assets, for example, opening a new branch. According to Davidson and Oleszek (1976), structural innovation arises from stresses in the organisation's internal environment or external dynamics. Five structural innovation types were identified and investigated in this study including, expansion of office, change to the common bond, amalgamation with another credit union, opening a new branch or closing an existing branch. Table 2 provides details of the structural innovations reported by credit unions analysed across the four countries.

Table 2. Panel A: Structural innovations

Panel B: Structural innovations introduced 2013 - 2018

Country	NI	RoI	Scotland	Ghana	Total	NI	RoI	Scotland	Ghana	Total
No. of credit unions (%)	45(100%)	45(100%)	27(100%)	41(100%)	158(100%)	45(100%)	45(100%)	27(100%)	41(100%)	158(100%)
Types of structural innovation										
1. Expansion of office	14(31.1%)	13(28.9%)	6(22.2%)	22(53.7%)	55(34.8%)	12(26.7%)	10(22.2%)	5(18.5)	19(46.3%)	46(29.1)
2. Change to the common bond	12(26.7%)	14(31.1%)	9(33.3%)	16(39.0%)	51(32.3%)	9(20%)	11(24.4%)	5(18.5%)	12(29.3%)	37(23.4%)
3. Amalgamation with another CU	4(8.9%)	16(35.6%)	1(3.7%)	4(9.8%)	25(15.8%)	5(11.1%)	14(31.1%)	1(3.7%)	4(9.8%)	24(15.2%)
4. Opened a new branch	5(11.1%)	5(11.1%)	3(11.1%)	12(29.3%)	25(15.8%)	6(13.3%)	6(13.3%)	4(14.8%)	10(24.4%)	26(16.5%)
5. Closed a branch	3(.06%)	1(.02%)	-	-	4(.03%)	3(6.7%)	1(2.2%)	-	-	4(2.5%)
Total	38	49	19	54	160	35	42	15	45	137
Mean number per CU^a	0.96	1.09	0.70	1.37	1.06	0.69	0.96	0.56	1.12	0.85
Standard deviation	1.21	1.06	0.82	1.16	1.11	0.99	1.13	0.80	1.08	1.04

- a. The mean figures for Panel 'A' represent the average total structural processes undertaken by CUs, whilst panel 'B' figures represent the average number introduced in the past five years. **Note:** Overall, 81 of the respondents that took part in the study identified that their credit union did not introduce any new structural process that they were aware of, including 28 of the 45 from NI, 19 of the 45 from the ROI, 17 of the 27 from Scotland and 17 of the 41 from Ghana.

An overall average of 1.06 structural innovations were identified for the sample credit unions in the study, with the majority of these (average of 0.85) implemented between 2013 and 2018. In terms of individual countries, the sample from the Republic of Ireland reported an average of 1.09 structural innovations, Northern Ireland reported 0.96, Scotland reported 0.70 and Ghana reported 1.37. The most common structural innovations noted in Panel A of Table 2 are the expansion of offices (34.8%) and changes to the common bond (32.3%), with most of these changes occurring in the period 2013 and 2018 (Panel B).

In terms of the sample from individual countries, five types of structural innovation were evident in both Northern Ireland and the Republic of Ireland and four types were evident in Scotland and Ghana (Panel A and Panel B). Specifically, in Northern Ireland, the expansion of offices is the most common type of structural innovation noted in Table 2, with 31.1% (Panel A) reporting this, and 26.7% (Panel B) reported engaging in the expansion of their office over the period between 2013 and 2018. A greater number of credit unions engaging in this activity in Northern Ireland is explained in part by the transfer of regulation of the sector from the local registrar to the FCA in 2012 (FCA, 2017). This transfer increased the regulatory burden on credit unions with the result that some smaller credit unions either closed or sought to be taken over. Interviewees from the larger credit unions that were involved in a takeover, referred to the takeover of small credit unions as office expansions, with the premises of the target credit union referred to as a new branch.

Amalgamation activity and changes to the common bond were prevalent in the Republic of Ireland overall (Panel A) and in the period 2013 to 2018 (Panel B). This may be explained by the extensive restructuring programme promoted by regulators in the Republic of Ireland since 2013. With financial support from the EU, regulators started to promote consolidation of the credit union sector in 2008. However, due to the difficult and time-consuming nature of amalgamating two or more credit unions, there was little evidence of restructuring until after 2013. The increase in restructuring is likely due to the formation of a statutory restructuring board to facilitate mergers between credit unions (ReBo, 2017). From 2008 to 2012, 11 credit unions ceased operations, 19 transfer of engagements (TOEs) took place, whilst 135 occurred between 2013 and 2018 (Central Bank of Ireland, 2019). This resulted in the consolidation of the sector from 419 credit unions in 2008 to 254 in 2018 (Central Bank of Ireland, 2019). The consolidation resulted in larger and financially stronger credit unions. The number of credit unions with an asset size larger than €100 million increased from 28 in 2013 to 54 in 2018 (Central Bank of Ireland, 2019). Conversely, the number of smaller credit unions with an asset size of less than €40 million reduced from 285 in 2013 to 199 in 2018 (Central Bank of Ireland, 2019).

In Scotland, there is less evidence of office expansion (22.2%, Panel A) and amalgamation activity (3.7%) relative to Northern Ireland and the Republic of Ireland. Instead, changes to the common bond is the highest activity reported by credit unions (33.3%, Panel A), with 18.5 % of these credit unions reporting changes to the common bond in the period from 2013 to 2018 (Panel B). The regulatory change that occurred in the Republic of Ireland in 1997 and in Northern Ireland in 2012 occurred in Scotland in 1996 (McKillop and Wilson, 2008). Changes to the legislation in Scotland provided an opportunity for credit unions to grow (McKillop and Wilson, 2003), by increasing the scope of their existing common bond (McKillop and Wilson, 2008). In addition, the Legislative Reform Order, 2011 further loosened the common bond in Scottish credit

unions by allowing corporate organisations and non-profits to be admitted as members (Harrison et al., 2016).

The most prevalent structural innovation reported by Ghanaian credit unions in Panel A is the expansion of offices (22 credit unions, 53.7%) and changes to the common bond (16 credit unions, 39%). Transfer of engagement and amalgamation activity was ongoing at the time of data collection. Over the period between 2013 and 2018, a high proportion of the respondents referred to a recent expansion of their offices (Panel B, 46.3%). This finding was confirmed in interviews, as a number of the interviewees referred to relocating their offices to new premises in order for them to be visible to the general public. Relocating to improve visibility is used by credit unions to compete with other financial service providers and to counter the view of credit unions as the poor man's bank (Anku-Tsedee and Amankwaa, 2015). Amalgamation activity was not as prevalent in the period from 2013 and 2018 (Panel B, 9.8%) as was expected given the environment. It may be that insufficient time has passed to observe the structural changes, as amalgamations take a long time to complete. Changes to the common bond were reported by 12 (29.3%) of the credit unions in Ghana. This may be explained by a more friendly regulatory environment (CUA, 2016). Until 2018, CUA, the national trade association was de facto the regulator of the sector, however, in 2017, the Bank of Ghana directed credit unions to register their operations with them. The bank then issued them with a license enabling them to operate in their respective locations (Bank of Ghana, 2017b). Several credit unions used this opportunity to expand their common bond. The expansion of common bonds was also stimulated by advances in technology, as some credit unions adopted a mobile money technological innovation in this period. This technology enables them to provide financial services to people who reside long distances from the credit union.

In summary, amalgamation activity was the most frequently noted structural innovation to occur in the Republic of Ireland over the period under review, whereas the expansion of offices was more prevalent in Northern Ireland, Scotland and Ghana. These innovations signal growth and consolidation of the sector as necessitated by changes to regulatory policy and indicative of developmental progression as identified by Ferguson and McKillop (1997; 2000), as well as McKillop and Wilson (2012; 2015). The next section discusses the findings on administrative innovations.

Administrative innovations

An administrative process refers to an organisational renewal process, which encompasses basic work activities within an organisation that are directly related to its management (Damanpour, 1991; Seyedi et al., 2013). Administrative innovation includes changes to, improvements in, and the introduction of, new social structures, reward and information systems, rules, procedures and communication authority structures that govern the relationships among members of an organisation (Mavondo et al., 2005). Table 3 provides details of the administrative innovations reported by credit unions to date, as well as innovations over the period 2013 to 2018 analysed across the four countries. An overall average of 1.39 administrative innovations were identified for the sample credit unions. Of these, 0.84 were introduced over the period 2013 to 2018. In terms of countries, the sample from Northern Ireland reported 1.18 administrative innovations, the Republic of Ireland reported an average of 1.78, Scotland reported 1.22 and Ghana reported 1.32.

Table 3. Panel A: Administrative innovations

Panel B: Administrative innovations introduced 2013 - 2018

Country	NI	Rol	Scotland	Ghana	Total	NI	Rol	Scotland	Ghana	Total
No. of credit unions (%)	45(100%)	45(100%)	27(100%)	41(100%)	158(100%)	45(100%)	45(100%)	27(100%)	41(100%)	158(100%)
Types of administrative innovations										
1. Flexible repayment	20(44.4%)	18(40.0%)	9(33.3%)	24(58.5%)	71(44.9%)	5(11.1%)	12(26.7%)	6(22.2%)	17(41.5%)	40(25.3%)
2. Online loan application	12(26.7%)	32(71.1%)	12(44.4%)	3(7.3%)	59(37.3%)	6(13.3%)	20(44.4%)	10(37%)	2(4.9%)	38(24.1%)
3. Advice on budgeting	10(22.2%)	10(22.2%)	2(7.4%)	9(22.0%)	31(19.6%)	4(8.9%)	6(13.3%)	-	4(9.8%)	14(8.9%)
4. Introduced cost for a service	3(6.7%)	13(28.9%)	3(11.1%)	7(17.1%)	26(16.5%)	7(14.5%)	15(33.3%)	3(11.1%)	7(17.1%)	32(20.3%)
5. Removed cost for a service	3(6.7%)	2(4.4%)	5(18.5%)	6(14.6%)	16(10.1%)	-	1(2.2%)	5(18.5%)	5(12.2%)	11(7%)
Additional processes										
6. Payment of allowance to directors	-	-	-	3(7.3%)	3(1.9%)	-	-	-	3(7.3%)	3(1.9%)
7. Call centre for out of hours	-	1(2.2%)	-	-	1(0.6%)	-	1(2.2%)	-	-	1(0.6%)
8. Payroll deduction	-	1(2.2%)	-	-	1(0.6%)	-	1(2.2%)	-	-	1(0.6%)
9. Employed paid staff	-	-	-	1(2.4%)	1(0.6%)	-	-	-	1(2.4%)	1(0.6%)
Total	48	77	31	53	209	22	56	24	39	141
Mean number per CU^a	1.18	1.78	1.22	1.32	1.39	0.36	1.13	0.96	0.95	0.84
Standard deviation	1.11	1.15	1.16	0.96	1.11	0.61	1.14	1.06	1.05	1.02

- a. The mean figures for Panel 'A' represent the average total administrative processes undertaken by CUs, whilst panel 'B' figures represent the average number introduced in the past five years.

Nine different types of administrative process have been identified from the survey, five in both Northern Ireland and Scotland and seven in the other two countries (Table 3, Panel A and Panel B). Of the nine, five are common to all four countries. These include flexible repayment processes, 71 (44.9%), online loan application, 51 (37.3%), advice on budgeting, 31 (19.6%), introduced cost for a service, 26 (16.5%) and removed cost for a service, 16 (10.1%). Of these, three types were introduced across the four countries between 2013 and 2018 (Table 3, Panel B), including flexible repayment, 40 (25.3%), online loan application, 38 (24.1%) and introduced cost for a service, 32 (20.3%). The most common administrative innovations noted in Panel A are flexible repayments, 71 (44.9%) and online loan applications, 59 (37.3%), with a similar pattern noted over the period 2013 and 2018 in Panel B.

Differences in the type of innovation activity arise when analysed across the four countries. For example, an online loan application facility was introduced by 32 (71.1%) of credit unions from the Republic of Ireland, but was not as evident in other countries, particularly in Ghana, where it was only introduced by three (7.3%) of the sample credit unions. The same pattern is observed over the period between 2013 and 2018 (Panel B). The higher prevalence of online loan applications in the Republic of Ireland reflects investment in the IT infrastructure made possible by EU funding (ReBo, 2017). The interviews also identified that financial technology firms visit the credit unions in Northern Ireland and the Republic of Ireland to promote new product offerings, including online loan application packages and this likely contributes to the large uptake of this innovation.

In Northern Ireland, the high number of credit unions offering flexible repayments (Panel A, 20, 44.4%) is attributed to the effects of the financial crisis (ILCU, 2018), that has affected institutions, individuals and working families, not only in Northern Ireland, but across the globe. This said, flexibility and relational factors help create the unique competitive advantage of credit unions over other financial institutions (Power et al., 2014). Panel B shows that seven credit unions in Northern Ireland introduced costs for their services between 2013 and 2018 (14.5%). Introduction of costs to services, such as fees for special advisory services or insurance agency services, were also introduced by credit unions from the other three countries over this period, with the sample in the Republic of Ireland, Scotland and Ghana reporting 15 (33.3%), 3 (11.1%) and 7 (17.1%) respectively. Conversely, between 2013 and 2018, with the exception of Northern Ireland, some credit unions in the other three countries reported removing costs for some services, such as the advisory services rendered to members.

In Scotland, 12 (44.4%) credit unions (Panel A), have an online loan application process, with ten (37%) of these occurring between 2013 and 2018 (Panel B). The high prevalence of online loan applications and their introduction in Scotland is explained by the fact that the UK government has been supporting the modernising of credit unions (Harrison et al., 2016). Recently, the devolved Scottish government has created a £10 million fund for credit unions, to invest in improving access to services (Thorpe, 2019). Credit unions from Ghana reported a high incidence of the use of flexible repayment processes 24 (58.5%) (Panel A), with 17 (41.5%) occurring between 2013 and 2018 (Table 3, Panel B).

Four additional types of administrative innovations to those identified in the literature and through a content analysis of websites and annual reports were identified through the survey: two from the Republic of Ireland (call centres for out of hours and payroll deduction) and two from Ghana (payment of an allowance to directors and employing paid staff). These additional innovations provide a deeper insight into the

current developments in the sector. For instance, the professionalism of the sector, in terms of hiring paid staff and payment of a sitting allowance to board members in Ghana, 3 (7.3%) (Table 3, panel A). These types of innovations are typically found in mature credit unions, such as those in the US, Canada, and Australia (Unda et al., 2017). This suggests the sector in Ghana is transitioning towards a more professional service sector to meet the needs of the growing middle class (Decardi-Nelson et al, 2012). In the Republic of Ireland, there were two identified innovations, call service centre for out of hours and payroll deduction. Payroll deduction is a service where a member's loan repayments are deducted periodically from their wages by the employing company and paid to the credit union, whereas call centre services provide a solution to members' queries, enabling them to have access to their credit unions for longer than the normal operational hours. This type of administrative innovation is particularly important, considering the current (at the time of writing) Coronavirus pandemic and the stay at home and social distancing restrictions enforced by national governments around the world. The next section presents findings on operational innovations.

Operational innovations

An operational process relates to improvements in and the introduction of a new managerial process that focuses on the improvement of quality in an organisation (Klingenberg et al., 2013). It is described as a powerful tool deployed by organisations in order to lower direct costs, simplify processes, bring about faster cycle times and better utilise assets (Hammer, 2004). Drawing from the extant literature, operational activities in credit unions include technological processes, such as the introduction of paperless transactions, the use of social media for the first time by a credit union to reach out to their members, adopting online banking and text messaging services (McKillop and Quinn, 2012). Online banking as a process relies on the availability of the internet to facilitate banking services, such as loan applications or transfer services (McKillop and Quinn, 2012). Online banking is conducted electronically using a computer, smartphone or tablet (McKillop and Quinn, 2012; 2015). Thus, in this study online banking is considered to be more operational in nature than a product, such as mobile banking. With the latter, a bank or a credit union provides an app for its customers to conduct financial transactions. The findings regarding operational innovations are presented in Table 4 below.

Table 4. Panel A: Operational innovations

Panel B: Operational innovations introduced between 2013-2018

Country	NI	RoI	Scotland	Ghana	Total	NI	RoI	Scotland	Ghana	Total
No. of credit unions (%)	45(100%)	45(100%)	27(100%)	41(100%)	158(100%)	45(100%)	45(100%)	27(100%)	41(100%)	158(100%)
Operational innovations										
1. Change to opening hours	25(55.6%)	30(66.7%)	9(33.3%)	16(39.0%)	80(50.6%)	16(35.6%)	20(44.4%)	8(29.6%)	12(29.3%)	56(35.4%)
2. Text message services	20(44.4%)	28(62.2%)	11(40.7%)	10(24.4%)	69(43.7%)	14(31.1%)	21(46.7%)	3(11.1%)	7(17.1%)	45(30.4%)
3. Social media	17(37.8%)	20(44.4%)	14(51.9%)	13(31.7%)	64(40.5%)	14(31.1%)	15(33.3%)	9(33.3%)	10(24.4%)	48(30.4%)
4. Online banking	11(24.4%)	28(62.2%)	10(37.0%)	1(2.4%)	50(31.6%)	7(15.6%)	21(46.7%)	9(33.3%)	1(2.4%)	38(24.1%)
5. Change to opening days	13(28.9%)	13(28.9%)	6(22.2%)	9(22.0%)	41(25.9%)	8(17.8%)	8(17.8%)	6(22.2%)	8(19.5%)	30(19%)
6. Telephone banking	7(15.6%)	13(28.9%)	7(25.9%)	4(9.8%)	31(19.6%)	6(13.3%)	8(17.8%)	5(18.5%)	2(4.9%)	21(13.3%)
7. Paperless transaction	4(8.9%)	12(26.7%)	3(11.1%)	2(4.9%)	21(13.3%)	2(4.4%)	6(13.3%)	2(7.4%)	2(4.9%)	12(7.6%)
Total	97	144	60	55	356	67	99	42	42	250
Mean number per CU^a	2.29	3.64	2.33	1.61	2.51	1.62	2.71	1.59	1.17	1.81
Standard deviation	1.55	1.68	2.13	1.39	1.82	1.35	1.67	1.69	1.43	1.63

- a. The mean figures for Panel 'A' represent the average total operational processes undertaken by CUs, whilst panel 'B' figures represent the average number introduced in the past five years.

An overall average of 2.51 operational innovations were identified for the sample credit unions in the study, with the majority of these (average 1.81) implemented between 2013 and 2018. In terms of individual countries, Northern Ireland reported an average of 2.29 operational innovations, the Republic of Ireland reported an average of 3.64, Scotland reported an average of 2.33 and Ghana reported an average of 1.61. It is also evident from Table 5.14 that seven types of operational innovations are common to all four countries in Panel A, with the most common four being changes to opening hours, 80 (50.6%), text message services, 69 (43.7%), social media, 64 (40.5%) and online banking, 50 (31.6%). Similarly, changes to opening hours, 56 (35.4%), text message services, 48 (30.4%) and social media, 48 (30.4%) are the most common types of operational innovations introduced between 2013 and 2018 (Panel B).

The high prevalence of operational innovations across the four countries suggests a conscious effort by managers of credit unions to improve the provision of services within their organisations. Operational innovations bring about speedier processes and better asset utilisation (Hammer, 2004). For instance, by introducing online banking, credit unions' members can access services without having to go into a branch. Similarly, social media has become a quick means of broadcasting vital information to members on the same platform (Frame et al, 2019; Roopadarshini and Shilpa, 2014). By adopting online banking and social media processes, services are carried out as quickly as possible when a transaction is being undertaken between credit unions and their members. In terms of better utilisation of assets, Table 4 shows how this has been achieved through a process, such as a change to opening hours and change to opening days. Changes to opening hours could be either extending or reducing operational hours. With the extension of opening hours, the assets of a credit union, such as office buildings and personnel, would be used more optimally. Whilst the reduction of opening hours might lead to a reduction in the cost of operations (for example electricity bills), increasing opening hours presents an opportunity for credit union members to have access to services for longer than usual.

From Panel A and B of Table 4, a notable difference exists between the countries in terms of the existing and introduced operational innovations. Over 60% of credit unions in the Republic of Ireland indicated engaging in three prominent operational innovations: changes to opening hours, 20 (44.4%), text message services, 21 (46.7%) and online banking, 15 (33.3%) (Panel A), with online banking and text message services being the most common innovations introduced in the Republic of Ireland between 2013 and 2018 (Panel B, 46.7% in both cases). Both innovations are linked to the restructuring and development of the credit union sector in the country as discussed in the structural innovation section.

In Northern Ireland, three types of operational innovations (Panel A) are common to credit unions, these include changes to opening hours, 25 (55.6%), text message services, 20 (44.4%) and social media, 17 (37.8%). These innovations are also prominent over the period 2013 and 2018 in Northern Ireland (Panel B). For Scotland, most credit unions focused their attention on introducing social media, 14 (51.9%), providing text message services, 11 (40.7%) and online banking, 10 (37%). The introduction of social media, 9 (33.3%), and online banking services, 9 (33.3%), were higher than the other operational types between 2013 and 2018 in Scotland (Panel B). The sector in Ghana reported similar levels and types of operational innovations to those reported for Northern Ireland credit unions (Panel A), however, changes to opening hours, 12 (29.3%) and social media, 10 (24.4%) were the two most common innovations introduced between 2013 and 2018 (Panel B).

Although, these innovations might appear basic and simply tinkering from an external perspective, they are important for organisational sustainability. For example, a study in the US has found that operational innovations of these types in an insurance company have resulted in a sevenfold increase in revenue growth, despite the fact that the company has not advertised the diversification or expansion of its services (Hammer, 2004). This means credit unions could benefit greatly from operational innovations, as they could help reduce the costs of operations and boost their surpluses. At the same time, operational innovations could help improve service quality in organisations, as found by Klingenberg et al. (2013). The next section presents the findings on marketing innovations.

Marketing innovations

A marketing innovation relates to the introduction of a new marketing process by a credit union. Marketing is defined as the way in which organisations communicate their new products and services to customers, in order to educate, inform and excite them (Malhotra et al., 2013; Prabhu, 2014). Marketing innovation is aimed at addressing the needs of customers and positioning a firm's products or services in the market, with the goal of increasing sales and revenue (OECD, 2005; Prabhu, 2014). Table 5 provides details of marketing innovations and those introduced over the period 2013 to 2018 as reported by the sample credit unions, analysed across the four countries.

Overall, an average of 0.98 marketing innovations (Panel A) were identified for the sample credit unions. Of these, an average of 0.51 were introduced over the period 2013 to 2018 (Panel B). In terms of countries, the average marketing innovation noted by sample credit unions range from 0.59 per credit union for Ghana, to 1.16 per credit unions for the Republic of Ireland (Panel A). Lower average marketing innovations were reported for the period between 2013 and 2018. For example, on average 0.26 marketing innovations were introduced for the sample credit unions from Scotland and 1.04 for those in the Republic of Ireland (Panel B).

Table 5.1 Panel A: Marketing innovations

Panel B: Marketing innovations introduced between 2013-2018

Country	NI	RoI	Scotland	Ghana	Total	NI	RoI	Scotland	Ghana	Total
No. of credit unions (%)	45(100%)	45(100%)	27(100%)	41(100%)	158(100%)	45(100%)	45(100%)	27(100%)	41(100%)	158(100%)
Marketing innovations										
1. Branding activities	8(17.8%)	25(55.6%)	6(22.2%)	8(19.5%)	47(29.7%)	3(6.7%)	16(35.6%)	2(7.4%)	3(7.3%)	24(15.2%)
2. Launching a new product	9(20.0%)	19(42.2%)	4(14.8%)	10(24.4%)	42(26.6%)	4(8.9%)	14(31.1%)	2(7.4%)	5(12.2%)	25(15.8%)
3. Monthly prize draw	3(6.7%)	19(42.2%)	4(14.8%)	1(2.4%)	27(17.1%)	1(2.2%)	12(26.7%)	1(3.7%)	1(2.4%)	15(9.5%)
4. Using a celebrity for promotion	5(11.1%)	7(15.6%)	2(7.4%)	-	14(8.9%)	3(6.7%)	3(6.7%)	1(3.7%)	-	7(4.4%)
5. Save and win promotion	3(6.7%)	2(4.4%)	-	5(12.2%)	10(6.3%)	2(4.4%)	2(4.4%)	-	4(9.8%)	8(5.1%)
6. Lottery game	1(2.2%)	-	2(7.4%)	-	3(1.9%)	-	-	1(3.7%)	-	1(0.6%)
Additional processes										
7. Car draw	-	1(2.2%)	-	-	1(0.6%)	-	1(2.2%)	-	-	1(0.6%)
8. Newspaper and radio adverts	1(2.2%)	1(2.2%)	-	1(2.4%)	3(1.9%)	1(2.2%)	1(2.2%)	-	1(2.4%)	3(1.9%)
9. Competition in schools	1(2.2%)	1(2.2%)	-	-	2(1.3%)	1(2.2%)	1(2.2%)	-	-	2(1.3%)
10. Newsletter	1(2.2%)	-	-	-	1(0.6%)	1(2.2%)	-	-	-	1(0.6%)
11. Price reduction promotion	1(2.2%)	-	-	-	1(0.6%)	1(2.2%)	-	-	-	1(0.6%)
12. Email marketing	-	1(2.2%)	-	-	1(0.6%)	-	1(2.2%)	-	-	1(0.6%)
Total	33	76	18	25	152	17	51	7	14	89
Mean number per CU^a	0.82	1.69	0.67	0.59	0.98	0.29	1.04	0.26	0.32	0.51
Standard deviation	1.05	1.16	0.92	0.84	1.10	0.69	1.04	0.59	0.61	0.84

- a. The mean figures for Panel 'A' represent the average total marketing processes undertaken by CUs, whilst panel 'B' figures represent the average number introduced in the past five years.

Three types of marketing activities are common to credit unions in all four countries (Table 5, Panel A and B). These are branding activities, 47 (29.7%) launching a new product, 42 (26.6%) and monthly prize draw, 27 (17.1%). Moreover, six additional types of marketing processes have been identified and include car draw, newspaper and radio advertisements, competitions in schools, newsletters, price reduction promotion and email marketing (see Table 5, from 7 to 12). Of the additional marketing innovations discovered, i.e. those that were not identified through the content analysis of the literature, as well as the annual reports of credit unions, four each were reported by credit unions from Northern Ireland and the Republic of Ireland, and one in Ghana. However, a notable difference exists between the Republic of Ireland and the other three countries, for example car draw promotions and digital marketing, in terms of both the prevalence and sophistication of marketing activities.

From Table 5, it can be seen that three main types of marketing innovations are prevalent in the sector in the Republic of Ireland (Panel A): branding activities, 25 (55.6%), launching a new product, 19 (42.2%) and monthly prize draw, 19 (42.2%). These are equally prevalent over the period between 2013 and 2018 in the country. However, in the other three countries, even though these marketing innovations are available, they are proportionally lower when compared with the Republic of Ireland (Panel A). For example, whilst the sample in Northern Ireland reported 8 (17%) for branding activities, 25 (55.6%) of the sample in the Republic of Ireland conducted these activities. This is similar to Scotland and Ghana as a limited number of marketing innovations (Panel B) have been introduced. Indeed, a survey by ILCU attributed the increase in the demand for loans in the Republic of Ireland and Northern Ireland to credit unions' marketing activities (ILCU, 2018). According to the survey, 77% of the respondents noted an increase in demand for loans (ILCU, 2018).

In the case of Ghana, branding activities, 8 (19.5%) and launching a new product, 10 (24.4%) are the two top marketing activities pursued by the sample. Indeed, CUA, the sector's trade body, identified marketing as an important tool for educating the public, as well as providing a brand image (Myjoyonline, 2020). This follows almost two years of crisis management of the country's entire financial services' industry, underpinned by the revocation of the licenses of seven prominent local banks, 39 microfinance institutions and 23 saving and loan companies by the Bank of Ghana (GBC, 2018; Bank of Ghana, 2019). According to the Bank of Ghana, these institutions were deemed to be insolvent and have no reasonable prospects of recovery, and their continued existence posed severe risks to the stability of the financial system of the country and to the interests of their depositors.

The importance of marketing is reflected in the credit union literature. For example, in the Republic of Ireland, ILCU recommended that credit unions invest in marketing activities (ILCU, 2018). More recently, researchers in both Africa and the US have encouraged credit unions to engage in branding activities in order to appeal to the middle classes and boost their image in local communities (Goglio and Alexopoulos, 2014; Mushonga et al., 2018). Indeed, evidence in the US has shown that credit unions' investment in marketing greatly pays off. Dopico (2018) calculates that an investment in marketing services of 0.1% by a credit union, results in an increase in asset growth of 0.79%. Given the potential benefits that may accrue from marketing activities, as well as it being championed by the various trade associations as a tool for education and rebranding, this probably explains the reason why credit unions are increasingly adopting these strategies, including branding, launching of products and prize draws.

Summary of key findings

Tables 2 to 5 presented findings of the univariate analysis of the incidence of processes innovations in credit unions across the four countries studied, including those introduced in the period 2013 to 2018.

Table 6 below summarises the main findings. Operational innovation is the most common form of processes innovation, with the respondents identifying an average of 2.51 different operational innovations. Innovations of this kind were found to be important in all of the countries, as credit unions seek to cut costs and boost their surplus (ILCU, 2018). In terms of structural innovations, the Republic of Ireland credit unions identified an average of 1.09, with Ghana credit unions higher at 1.37. This reflects differences in the timing of the restructuring of the sector in the two countries. In the Republic of Ireland, credit unions have been experiencing transfers of engagement and mergers since 2013 in a bid to consolidate the sector (Credit Union Commission Report, 2018; McKillop et al., 2015). In Ghana, the rebranding of the sector (i.e. expansion and acquiring new offices) rather than amalgamation activity contributed to the higher average number of structural innovations. For Northern Ireland and Scotland, the average structural innovations within the sector were 0.96 and 0.70 respectively. Thus, structural innovations have taken place in these two countries, but not at the levels seen in the Republic of Ireland. Moreover, a further analysis of the study data reveals that the marketing activities of credit unions are developing. However, it is not at the same level in all the countries in the sample. The sector in the Republic of Ireland initiated an average of 1.69 marketing services, the highest in the sample. Bhaird (2017) recommended that the sector in the Republic of Ireland should embrace marketing to win over the middle class in Ireland. Similarly, credit unions in South Africa have been urged to engage in marketing services in order to gain an operational advantage, create awareness and rebrand their image (Mushonga et al., 2018). In Ghana, marketing has become a key policy strand of the trade association (CUA) to rebrand the sector (Myjoyonline, 2020).

Table 6. Panel A: Average number of innovations implemented to date

B. Average number of innovations introduced between 2013–2018

Countries	NI (Average)	RoI (Average)	Scotland (Average)	Ghana (Average)	Total (Average)	NI (Average)	RoI (Average)	Scotland (Average)	Ghana (Average)	Total (Average)
Average innovations	No. (Max)	No. (Max)	No. (Max)	No. (Max)	No. (Max)	No. (Max)	No. (Max)	No. (Max)	No. (Max)	No. (Max)
Process innovations										
1. Structural innovation	0.96(4)	1.09(4)	0.70(2)	1.37(4)	1.06(4)	0.69(4)	0.96(4)	0.56(2)	1.12(4)	0.85(4)
2. Administrative innovation	1.18(4)	1.78(4)	1.22(4)	1.32(4)	1.39(4)	0.36(2)	1.13(4)	0.96(4)	0.95(5)	0.84(5)
3. Operational innovation	2.29(6)	3.64(7)	2.33(7)	1.61(5)	2.51(7)	1.62(5)	2.71(7)	1.59(7)	1.17(5)	1.81(7)
4. Marketing innovation	0.82(4)	1.69(4)	0.67(3)	0.59(3)	0.98(4)	0.29(3)	1.04(4)	0.26(2)	0.32(2)	0.51(4)
Total	5.25	8.20	4.92	4.89	5.94	2.96	5.84	3.37	3.56	4.01

Limitations and recommendation for future research

The study provided theoretical and empirical insight into process innovation of credit unions from four different countries. However, some limitations have been identified. For example, as with all survey studies, the low response rate from the survey is a limitation. The explanation for the low response rate may be related to the fact that the study targeted CEOs, managers and directors of credit unions, regarded as busy officials with limited time at their disposal (Pettigrew, 1992; Zona et al., 2013). Typically, directors of credit unions work elsewhere and only visit their credit unions periodically. This said, a combination of techniques was used, including a postal survey, online survey, and face-to-face survey where practical in order to increase the potential for a high response rate. The online survey was distributed three times, face-to-face surveys were carried out in Ghana and the postal survey distributed twice. However, the sample size in this study could have been larger. Therefore, future studies on credit unions in the four study countries would lend validity to the results.

In addition, this study has identified different categories of process innovation and was limited to four countries' credit unions. Considering that credit unions services in modern economy overlaps with the services of commercial banks (Bauer, 2015), a comparative study of other financial intermediaries such as commercial banks processes relative to that of credit unions. This will establish clearly whether credit unions are drifting away from their main principles of achieving both social and economic objectives (Power et al., 2014). This particularly important, given the fundamental changes brought about by COVID 19 and technological revolution in financial intermediation services.

Policy implications

This study confirms the driving force of regulation on credit unions' structural development in terms of consolidation, in particular, the recent regulatory change in all the countries studied. Regulation of the sector is aimed at consolidation of the sector to create a smaller number of larger credit unions as in the Republic of Ireland. As large asset size is associated with professionalism of the sector, have advantage over smaller credit unions in terms of regulatory burden (costs associated with regulation), due to economies of scale (Ferri and Kalmi, 2014), and the services provided such as mortgage are comparable to commercial banks (McKillop and Wilson, 2015). In addition, consolidation often result in larger and financially stronger credit unions. For example, the number of credit unions with an asset size larger than €100 million increased from 28 in 2013 to 54 in 2018 in the Republic of Ireland (Central Bank of Ireland, 2019), whilst the number of smaller credit unions with an asset size of less than €40 million reduced from 285 in 2013 to 199 in 2018 (Central Bank of Ireland, 2019). This study suggests that deregulation of the credit union sector would provide additional impetus for process innovation which might also leads to product and service innovations (Musah et al, 2022) and the sector innovation in general. Our study also shows that credit unions needed both human and financial resources for innovation. Structural innovation of the Irish credit unions sector was a policy decision from the central Bank of Ireland. For example, a statutory restructuring board was established to facilitate mergers between credit unions (ReBo, 2017). In addition, the EU provided €250 million financial support to the credit union sector to help it restructure (McKillop and Quinn, 2015). Therefore, we recommend similar policies across transitional sector credit unions in Northern Ireland, Scotland and Ghana. This would enable the sector to engage in meaningful mortgage services provision for credit unions members as evidenced in the republic of Ireland.

Note: The survey instrument is not attached to this paper because of copyright issues. However, it is available in private should the reviewer require.

Appendix 1

Dimensions of innovation framework

Dimensions of innovation framework		Innovation categories
Innovation as a process	Innovation as an outcome	Process innovations
Level <i>Individual/Group</i>	Form <i>Product and Service</i>	Structural innovations
Influences <i>Resources/Market</i>	Magnitude <i>Incremental/Radical</i>	Administrative innovations
Direction <i>Top-down/Bottom-</i>	Referent <i>Firm/Market/Industrv</i>	Operational innovations
Source <i>Invention/adoption</i>	Type <i>Technical/administrativ</i>	Marketing innovations
Locus <i>Firm/Network</i>	Nature <i>Tacit/Explicit</i>	

Adapted from Crossan and Apaydin (2010, p. 1167)

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