



Intellectual capital and performance: testing interaction effects

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Abstract

Purpose – The purpose of this paper is to examine the interaction effect of intellectual capital elements and how they fuse to affect financial performance in microfinance institutions. The major purpose is to explore the appropriate blend or mix of intellectual capital elements that explains the source of value creation – hence performance – in microfinance institutions.

Design/methodology/approach – The paper adopts the ModGraph program (Excel version) along with the Kenny and Boran approach to test conditional hypotheses.

Findings – The magnitude effect of human capital on performance depends on any of structural or relational capital; hence the assumption of nonadditivity is met. However, no significant interaction effects were established between relational and structural capital.

Research limitations/implications – Only a single research methodological approach was employed and future research through interviews could be undertaken to triangulate. Furthermore, the findings from the present study are cross-sectional – future research should be undertaken to examine the multiplicative effects studied in this paper across time

Practical implications – In order to boost the wealth of microfinance institutions in Uganda, managers should always endeavor to find a viable intellectual capital mix or blend that can add value to the firm.

Originality/value – This is the first study that focuses on testing the interactive effects of intellectual capital elements on financial performance in Ugandan microfinance institutions.

Keywords Intellectual capital, Financial institutions, Social interaction, Financial performance, Uganda

Paper type Research paper



Introduction

The recent changes in the global economy, consisting of complex, dynamic and competitive environment have led to a difference between the modern approach to value creation and the traditional way of monitoring operations (Ting and Lean, 2009). More so, Cuganesan (2006) observed that rapid technological changes, increasingly sophisticated customers and the importance of innovation shifted the bases of competition for many businesses away from traditional physical and financial resources to intellectual assets. Thus, there is wide spread recognition that intellectual capital (a strategic resource) is critical force that drives business growth (Huang and Liu, 2005).

One particular industry that is so competitive and dynamic is the microfinance (CGAP, 2002; Adongo and Christopher, 2005). This industry is complex and highly innovative (Kalyango, 2004), with great potential to expand the financial frontier to the poor in a sustainable manner (Littlefield *et al.*, 2003), and to a great extent dependent on intellectual capital for a source of renewal (Sharabati *et al.*, n.d.).

Much of the extant research on intellectual capital has focused on the developed world – specifically within Scandinavian nations (Sharabati *et al.*, n.d.). However, this phenomenon has a global appeal because of its quest for solutions to the nations' development challenge (CGAP, 2002). In addition, there is great interest in advancing intellectual capital in developing countries, Uganda being the best choice because of:

- the adopted market-oriented and enterprise development approach by the microfinance industry;
- the major reforms in the financial sector, including commercialization and regulation of microfinance institutions' (MFIs') operations;
- quite a number of MFIs, which are more than 1,500 (AMFIU, 2009); and
- stiff competition that never existed before in the industry.

Microfinance industry represents part of financial sector set up to finance small and micro-enterprises, which are excluded from the traditional banking practice (Labie, 2001; Ledgerwood, 1999; Kalyango, 2004; Megicks *et al.*, 2005). Over the past decade the industry has transformed into a large, dynamic private sector catering for the financial needs of the low-income household and economically poor (Nannyonjo and Nsubuga, 2004). Most firms in the industry have embraced a more business-oriented outlook and maintaining their target groups of economically active poor while focusing on achieving operational and financial sustainability (Kalyango, 2005; Baguma, 2008). The Ugandan microfinance industry has therefore adopted market-oriented and enterprise development approach after suspending a social-mission-oriented activity that could no longer be undertaken on a commercial basis (Fernando, 2000). While social orientation remains important, today a core group of microfinance service providers considers microfinance as a commercial operation and operate on a commercial basis. The commercialization has therefore made the industry more competitive (Fernando, 2000). The microfinance industry has also reduced its dependency on donor grants and concessional funding which have further threatened performance of microfinance firms (Kalyango, 2004). The above challenges are serious threats to performance of microfinance industry (Baguma, 2008).

As a result, microfinance industry has recognized that a sustainable solution to the above challenges lies in building more efficient and strong financial institutions that are capable of cultivating strategic assets that are firm specific. Ugandan microfinance firms have realized that increased investment and management of assets that are valuable, rare, and hard-to-imitate (Barney, 1991; Stiles and Kulvisaechana, 2004) is the answer to the challenges faced (Baguma, 2008; Nannyonjo and Nsubuga, 2004). They are assets which enhance the firm's competitive advantage and superior performance, which Stewart (1997) referred to as intellectual capital. This therefore provides a fruitful setting for intellectual capital assessment in Ugandan microfinance industry.

The research setting for this particular study is unique because the concept of intellectual capital has not been given serious attention in Uganda. The fact that the study covered three predictor variables (HC, RC and SC) it was appropriate to test the

interaction effect of these dimensions on performance. According to Friedrich (1982), when the research design involves two or more independent variables, there is always more to consider than simply the “main effects” of each of the independent variables. This study is hence expected to benefit stakeholders as follows:

- Microfinance institutions will have a more definite and direct understanding of intellectual capital mix or blend that is useful to their success. Moreover, Bennet (2000) had earlier observed that knowledge on the right blend of intellectual resources eases the management of intellectual assets to create firm value.
- Besides, understanding of how intellectual capital elements combine to influence firm performance leads to better resource allocation, which eventually promotes better firm performance.
- Furthermore, this study represents one of only a handful in extant literature to focus on Uganda and the first one to focus on measuring intellectual capital development in the microfinance industry. It thus offers a novel perspective.

This paper is organized into five sections. The first section is the brief overview of the research and contribution of the study. It is followed by literature review and hypotheses in the second section to discuss the theoretical background of the research and previous studies on intellectual capital. The third section is to discuss the source of data, research methodology and framework. The fourth section concentrates on interpretation of the findings and discussion. Finally, the fifth section concludes and gives recommendation for future research.

Literature review

While earlier scholars may not agree on the precise definition and shape of intellectual capital, there is broad consensus that it contains human capital, relational capital and structural capital (Tovstiga and Tulugurova, 2009; Bontis, 2002; Stewart, 1997; Edvinsson and Sullivan, 1996, Lynn, 1998). Such taxonomy permits researchers such as Sofian *et al.* (2008) to delineate intellectual capital as the possession of knowledge and experience, professional knowledge and skill, goal relationships, and technological capacities, whose synergic effect can boost firm performance. Edvinsson and Malone (1997, p. 358) broadened the definition to “knowledge that can be converted into value”. On the other hand, Halim (2010) conceptualized human capital as what a single employee brings into the value adding processes, consisting of professional competence, social competence, employee motivation, and leadership ability. Maheran and Khairu (2009) describe structural capital as competitive intelligence, formulas, information systems, patents, policies, etc., resulted from the products or systems the firm has created over time. In the same way, Welbourne (2008) delineates relational capital as an invisible asset based on developing, maintaining and nurturing high- quality relationships with any organization, individuals or group that influences business performance.

Relationship of intellectual capital dimensions and financial performance

Although the intellectual capital dimensions are sources of firm competitive advantage and superior performance, they are however, not equally important (Bontis, 1998). The extant literature emphasizes that one or several dimensions of intellectual capital affect firm performance in varying magnitudes (Bontis, 2002; Wang and Chang, 2005; Pablos,

2004). Besides, in some studies, mixed empirical results, which at the same time contradict theoretical underpinnings have dominated intellectual capital literature. For example, theoretical considerations indicate that human capital is central to intellectual capital base, the former being a source of innovation and renewal (Stewart, 1997). However, Wang and Chang (2005) studies in Taiwan Technological Information Industries discovered that all intellectual capital elements have a direct and significant impact on the enterprise performance except the human capital. On the other hand, Lopez *et al.* (2004) confirmed the indirect effect of human capital on firm performance.

Besides, Landeiro (2003) argued that human capital can influence firm performance if the system in place promotes knowledge generation and transfer, which are sources of firm's sustainable competitive advantage.

In a related case, Pfeffer (1994) and Uzzi (1996) established that human capital and relational capital play an important role in influencing organizational performance. These scholars shared the same view with Youndt and Snell (2004) who argued that high level of relational capital promotes effective planning, problem solving and troubleshooting, all of which increase production and service delivery efficiencies. To the contrary, Pablos (2004) established that out of the three elements of intellectual capital, only structural capital had a direct and significant effect on organizational performance. Li and Wu (2004) also confirmed the important role of structural capital in influencing firm performance.

The above discussion confirms the inconsistencies in the effect of intellectual capital dimensions on firm performance. However, PekChen (2005) and Firer and Williams (2003), observed that such contradictions are expected, simply because the impact intellectual capital dimensions have on firm performance is industry and country specific. F-Jardon and Martos (2009) share the same view and observed that the existence of some element differentials in the companies can condition the effect of intellectual capital on firm performance. In the same vein, the social cognitive theory by Bandura (1986) argued that different sets of environments provoke different responses and study results. Pitt *et al.* (1996) and Ngoma (2009) concur with PekChen (2005) and Firer and Williams (2003) and argued that even replications of studies should not necessarily be clones of the original studies. Variations are normal, and may even add insights as well as add to the development of theory (Pitt *et al.*, 1996). Despite the relevance of these works, still empirical research was needed to test the mutual effect of individual intellectual capital dimensions on MFI performance in Uganda. The above reviewed literature lends to the following hypotheses:

- H1.* Human capital positively affects financial performance in MFIs in Uganda.
- H2.* Structural capital positively affects financial performance in MFIs in Uganda.
- H3.* Relational capital positively affects financial performance in MFIs in Uganda.

Complementary of intellectual capital dimensions

From another perspective, Rivkin (2000), Siggelkow (2002) and Bontis and Stovel (2002) indicate that the three intellectual capital dimensions are interrelated and operate in interactive or collaborative way to form a strong intellectual capital base which influences the firm's value position. Value is thus created and performance is influenced whenever there is adequate combination of the intellectual capital elements (Edvinsson and Malone, 1997; Bukh, 2003). Further studies by PekChen (2005) in

Malaysian banks showed that intellectual capital dimensions affect performance while exhibiting significant relationship among them. Similarly, Wang and Chang (2005) argued that interaction between the intellectual capital elements of an organization is additive in that the value of one element is increased by the presence of other elements. This is however contrary to Mouritsen (1998) observations. Mouritsen (1998) pointed out that the separate elements of intellectual capital are not additive, but multiplicative in nature; and urged researchers always to know how the elements interact to produce synergic value. This point of view echoes the conclusions of Friedrich (1982) who also argued that the effect of two or more variables working together leads to results that would not be anticipated on the basis of the main effects of those variables. It is therefore worth noting that managing intellectual capital requires one to take keen interest to explore how key intellectual capital elements interact to cause effect.

Shih *et al.* (2010) argued that human capital and relational capital are inherently connected, and can be a point of differentiation for the organization if relational capital is cultivated. Welbourne (2008) observed that relational and human capitals are intrinsically linked because it is people within the firm that create, maintain and nurture the relationship that contribute to firm performance every day. This connection between the human capitals and relational capital is illustrated in Figure 1.

This association links well with the resource-based view, with its emphasis on bundles and combinations of resources (Barney, 1991). Besides, this connection is supported by social capital theory by Nahapiet and Ghoshal (1998), which stresses the need to create and maintain linkages between individuals that are non-imitable, tacit, rare and durable. All these translate into strategic assets that boost organizational competitive advantage and superior performance (Barney, 1991; Stiles and Kulvisaeachana, 2004). Accordingly, relational capital developed between team members, never mind with the other various stakeholders, is more central to business performance than the human capital provided by the individuals themselves (Welbourne, 2008). Uzzi (1996) and Pablos (2004) share the same view with Welbourne; because they all believe that human capital and relational capital complement each other to influence firm performance.

In a related case, Shih *et al.* (2010) identified structural capital as a supportive infrastructure of human capital. In support of this assertion, Shih *et al.* (2010) contend that structural capital provides the environment that encourages individuals to invest their human capital to create and leverage its knowledge. In support of this, Bontis

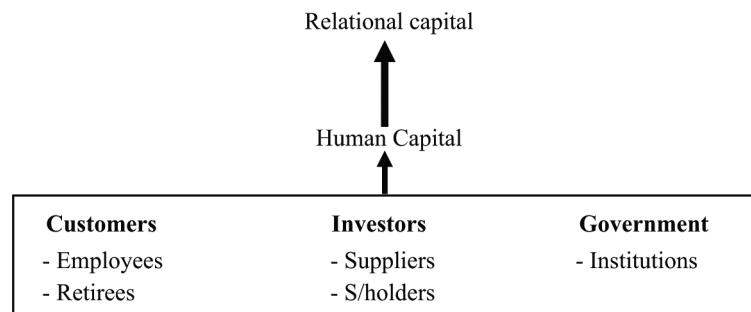


Figure 1.

Source: Reviewed Literature

(1998) argued that human capital cannot be isolated from structural capital if firm goals are to be achieved. Accordingly, human capital by itself is of little value without the leveraging effect of the firm's supporting structural capital resource. This collaborates well with studies conducted by Bontis (2000) in Malaysian industries that revealed that human capital and relational capital are complemented by structural capital to achieve better performance.

Central to the reviewed literature, it is clear that intellectual capital dimensions have to complement each other to achieve organizational goals. However, what is not yet known is the intellectual capital mix or blend that can promote firm's competitive advantage and superior performance, more especially in microfinance industry. Owing to the views of Firer and Williams (2003) and PekChen (2005), multiplicative or complementary effect of intellectual capital dimensions varies from firm to firm; may even be industry specific. Arising from above observations, spurious relationships that give rise to the following conditional hypotheses were tested in this study:

- H4.* Human capital influences financial performance if it interacts with relational capital in Microfinance institutions.
- H5.* Human capital influences financial performance if it interacts with structural capital in Microfinance institutions
- H6.* Structural capital influences financial performance if it interacts with relational capital in Microfinance institutions.

Study design and methodology

This study used cross-sectional and quantitative research designs to address the hypotheses covered in this research.

The study population included 78 microfinance institutions registered with Association of Microfinance institutions (AMFIU) in Uganda (*Microfinance Directory 2009/10*). Sample size of 65 firms was targeted and arrived at by adopting Yamane's (1973) sample size selection approach. According to Yamane, sample size is given by:

$$n = N/1 + N(e)^2$$

where:

- n = is a sample size;
- N = is total population; and
- E = is tolerable error.

On the basis of Yamane's approach with total population (*N*) 78 and tolerable error (*e*) 0.5 percent, the sample size (*n*) was 65 firms. Yamane's sample selection was preferred because it fairly yields a representative sample. Besides, the sample size generated using this approach fairly mirrors the results one would have got using a table of random samples by Krejcie and Morgan (1970). Simple random sampling was employed to select 65 firms from the total population of 78 firms.

The unit of analysis was microfinance institutions whose senior members of staff were the units of inquiry. Though a maximum of eight senior managers per firm were targeted, number of respondents from the firms ranged between five and seven senior

managers. To address variations in firm responses, a minimum of five senior managers were considered for analysis. The decision to accept a minimum of five senior staff per firm is based on Ntoumanis' (2001) and Field's (2006) guidelines on sample selection. Other scholars like Baer and Frese (2003), and Ngoma (2009) adopted and used a minimum of three respondents per firm. Thus, a minimum of five senior managers per MFI was sufficient for the study. However, out of 65 firms, 51 responded, hence giving a response rate of 78.4 percent.

Measurement of variables

Operationalization of study variables was based on previous studies and the detailed review of the existing literature. In line with measurement items used in previous studies, a five-point Likert scale developed by Rensis Likert in the 1930s was adopted for all item scales; anchored on a five point ranging from 1 = strongly disagree to 5 = strongly agree. Intellectual capital was sub-divided into three elements: human capital, structural capital and relational capital. Each dimension was measured basing on the works of other scholars and modified to match the Ugandan study context.

Human capital was measured using the Intangible Asset Monitor developed by Sveiby (2001) and later modified by Petty and Guthrie (2004). The questions were developed to tap aspects of employee know-how, education, vocational qualifications, work-related knowledge, work-related competence, entrepreneurial spirit, innovations, proactive and reactive abilities, and changeability.

Several aspects to measure structural capital included organizational culture, orientation to quality, innovation, continuous improvement, information systems and teamwork (Wang and Chang, 2005; Brooking, 1996; Roos *et al.*, 1997; Sveiby, 1997; Bontis and Stovel, 2002; Kaplan and Norton, 2004). Relational capital was measured using a combination of instruments developed by Edvinsson and Malone (1997); Rindfleisch and Moorman (2001), modified and used by Huang and Chang (2007). The main aspects included network levels, customer capital and level of marketing channels.

Financial performance was measured basing on the works of Ledgerwood (1999) and the Performance Monitoring Tool (2005/2008). From the financial point of view, ratios are appropriate performance measures because they eliminate the effect of the size (F-Jardon and Martos, 2009). In this study, financial performance ratios of portfolio at risk (PAR), Net profit ratio, loan loss recovery ratio, repayment rate, yield on portfolio, return on assets (ROA) were considered.

Validation of research instruments

A questionnaire was validated through expert interviews and a panel of practitioners. Intellectual capital dimensions of human, structural and relational capital yielded a content validity index (CVI) of 0.85, 0.81 and 0.79 respectively. Similarly, financial performance registered CVI of 0.81. These results signify that the contents of the instrument/questionnaire represented the domain of the constructs being studied. Saunders *et al.* (2006) state that CVIs of 0.70 or more are considered good.

Further tests covered the reliability of the instrument and Cronbach alpha values for intellectual capital dimensions and financial performance were all above 0.80, suggesting adequate internal validity. Anastasi (1982) and Nunnally (1978) state that reliability coefficients of 0.70 or more signify high validity of instruments.

Data management and analysis

Principal component analyses were performed to identify patterns in data and to reduce data to a manageable level (Field, 2006). The analysis produced three factors of intellectual capital accounting for 62.5 percent of variance. More so, the analysis yielded two factors of financial performance and explained 65 percent of variance as shown in the Appendix, Tables AI and AII.

Common method bias was addressed in this study by collecting data from at least five senior managers of each MFI and sourcing most of the data relating to the dependent variable from MFIs' published financial reports, accessed on www.microfinance-mixmarket on September 28, 2008. This approach is supported by Podsakoff *et al.* (2003). Potential effects of response pattern biases were reduced by incorporating negatively worded items on the questionnaire (Hinkin, 1995; Drasgow and Idaszak, 1987). The logic is that negatively worded items are like cognitive "speed bumps" that require respondents to engage in a more controlled, as opposed to automatically cognitive processing (Hinken, 1995)

Data were checked, cleaned and aggregated to a firm level using the name of the firm as a breaking variable (Field, 2006). Completed questionnaires were further checked for missing values and inconsistencies in responses given by the respondents. Simple frequency runs were made to screen the data so as to identify missing values. The identified values were a result of omissions made by respondents and constituted less than 1 percent of the data; thus, considered trivial (Little and Rubin, 2002) and inconsequential to suppress the standard deviation (Field, 2006; Mundfrom and Whitcomb, 1998). The fact that missing values were as result of omissions and unrelated to other values or variables, met the criteria of data missing completely at random (MCAR) (Little and Rubin, 2002; Acuna *et al.*, 2003). Central to the above facts, mean imputation replacement method was found suitable for this study (Field, 2006; Little and Rubin, 2002; Acuna *et al.*, 2003; Researcher Development Initiative, n.d.).

Hierarchical regression approach was used in this study because of its capacity to indicate precisely what happens to the model as different predictor variables are introduced in the model.

Tests for interactions of different predictor variables were conducted in this study to establish whether the magnitude of an effect is greater at one level of a variable than at another. According to Aiken and West (1991) two variables interact if a particular combination of variables leads to results that would not be anticipated on the basis of the main effects of those variables. The test for interaction was carried out using the ModGraph program (an excel version program) by Jose (2008); which is based on the works of Field (2006) and Aiken and West (1991). Interaction graphs were generated using the mean values and standard deviations of both main effects (centered variables) as well the unstandardized regression coefficients so as to confirm the existence of interaction effects (Jose, 2008).

Results

Sample characteristics

Data from 51 out of 65 targeted firms representing a 78 percent response rate were received. Of these, 47 percent (24) were from central, 29 percent (15) western, 10 percent (five) northern and 14 percent (seven) eastern regions of Uganda. The majority (82 percent) of microfinance institutions' capital structure consists of equity and loans and their

average capital size was greater than 2 billion Uganda shillings. The bigger percentage (76 percent) of the firms has been operating for more than 15 years. The mean scores of variables ranged between 3.21 and 4.31 and standard deviations in the ranges of 0.47 to 0.81. Since the standard deviations are small compared to mean values, it is true the computed means highly represent the observed data. In effect, the calculated averages are a good replica of reality (Grayson, 2004; Field, 2006; Saunders *et al.*, 2006).

Correlation and regression analyses

Correlation results presented in Table I indicate that intellectual capital dimensions (human capital, structural capital and relational capital) have a substantive and significant relationship with financial performance ($r = 0.544, p < 0.01$; $r = 0.460, p < 0.01, r = 0.424, p < 0.01$) respectively. The results signify that increasing intellectual capital elements strengthens their associations with financial performance. Similar results were earlier achieved by Hsun-Shih *et al.* (2010), Ting and Lean (2009), Bontis (2002), Sharabati *et al.* (n.d.), Davidson (2000), Stiles (2005) and Stewart (1997).

Consistent with the above results, the regression results in Table II (model 2) revealed that human capital ($B = 0.70, p < 0.01$) and structural capital ($B = 0.45, p < 0.05$) were significant predictors of financial performance, accounting for 38 percent of variance in financial performance.

The inclusion of interactive term (Structural \times Human) in model three, increased the predictive power of the main effects (human and structural capital) by 6 percent ($B = 0.46, p < 0.05$) from 38 percent to 44 percent.

The above results indicate that the interactive term boosts the main effects to explain variance in financial performance. However, Jose (2008) argued that the

Table I.
Zero order correlation between intellectual elements and financial performance

| | Means | SD | Structural | Human | Relational | Performance |
|--------------------|-------|------|------------|-------|------------|-------------|
| Structural capital | 4.31 | 0.55 | 1 | | | |
| Human capital | 4.12 | 0.46 | 0.416* | 1 | | |
| Relational capital | 4.07 | 0.81 | 0.181 | 0.26* | 1 | |
| Performance | 3.21 | 0.79 | 0.46* | 0.54* | 0.42* | 1 |

Note: *Correlation is significant at the 0.01 level (one-tailed)

Table II.
Regression of performance on human, structural capital and interaction term

| | Model 1 <i>B</i> | Model 2 <i>B</i> | Model 3 <i>B</i> | Collinearity tests | |
|---------------------------|---------------------|---------------------|---------------------|--------------------|------|
| | | | | Tolerance | VIF |
| Constant | 3.21** | 3.20** | 0.32** | | |
| Human Capital | 0.93** | 0.70** | 0.78** | 1.00 | 1.00 |
| Structural Capital | | 0.45* | 0.46* | 0.95 | 1.04 |
| Structural*Human capital | | | 0.46* | 0.49 | 2.04 |
| <i>R</i> squared | 0.29 | 0.38 | 0.44 | na | na |
| Adjusted <i>R</i> squared | 0.28 | 0.35 | 0.40 | na | na |
| <i>R</i> squared change | – | 0.08 | 0.06 | na | na |
| Sig. | 0.00 | 0.01 | 0.03 | na | na |

Notes: *Correlation is significant at the 0.05 level (one-tailed); ** correlation is significant at the 0.01 level (one-tailed)

complementary effect of variables can be appropriately proved and interpreted basing on the slopes of the graphs. As long as the magnitude of an effect is greater at one level of a variable than at another, it means a significant interaction has occurred (Aiken and West, 1991; Jose, 2008). This implies that, the graphs should not be parallel or must have different gradients or slopes for interaction to be significant. The graph in the Appendix, Figure A1 indicates that the effect of human capital on financial performance differs depending on the level of the structural capital, which further confirms a significant multiplicative effect between the two variables (Aiken and West, 1991; Jose, 2008).

Similarly, results in Table III indicate that structural capital ($B = 0.69, p < 0.01$) and relational capital ($B = 0.41, p < 0.01$) are significant predictors of financial performance, explaining 42 percent of variance in financial performance. However, the introduction of the interactive term in model three did not cause significant change in the predictive power of mutual effects on financial performance ($B = 0.133, p > 0.05$).

Consistent with the above results, the magnitude effect of structural capital on financial performance is static at all levels of relational capital as indicated in Figure 3. This again signifies that complementary effect of structural capital and relational capital does not cause a significant effect on financial performance (Aiken and West, 1991; Jose, 2008) in Ugandan MFIs.

In a related case, human capital ($B = 0.79, p < 0.01$) and relational capital ($B = 0.30, p < 0.01$) account for 38 percent of the variance in financial performance as shown in Table IV. However, main effects and interactive term (human \times relational capitals) significantly account for 44 percent of the variance in financial performance. Out of 44 percent, interactive term significantly contributes 6 percent of variance in financial performance.

The above results indicate that the interactive term boosts the predictive power of main effects to explain variance in financial performance. More so, Figure 4 indicates that the effect of human capital on financial performance depends on different levels of relational capital. Since the magnitude effect is greater at one level of a variable than at another, it is enough to conclude that human capital and relational capitals fuse to cause a significant effect in MFIs' financial performance.

| | Model 1 <i>B</i> | Model 2 <i>B</i> | Model 3 <i>B</i> | Collinearity tests | |
|-------------------------------|---------------------|---------------------|---------------------|--------------------|------|
| | | | | Tolerance | VIF |
| Constant | 3.20* | 3.20* | 3.22* | | |
| Structural capital | 0.70* | 0.69* | 0.66* | 1.00 | 1.00 |
| Relational capital | | 0.41* | 0.39* | 1.00 | 1.00 |
| Structural*Relational capital | | | 0.13 | 0.46 | 2.19 |
| <i>R</i> | 0.49 | 0.65 | 0.65 | na | na |
| <i>R</i> squared | 0.24 | 0.42 | 0.42 | na | na |
| Adjusted <i>R</i> squared | 0.22 | 0.39 | 0.38 | na | na |
| <i>R</i> squared change | – | 0.18 | 0.01 | na | na |
| Sig. | 0.00 | 0.00 | 0.51 | na | na |

Notes: *Correlation is significant at the 0.01 level (one-tailed)

Table III.
Regression of performance on structural, relational capital and interaction term

Table IV.
Regression of
performance on human,
relational capital and
interaction term

| | Model 1 <i>B</i> | Model 2 <i>B</i> | Model 3 <i>B</i> | Collinearity Tolerance | VIF |
|---------------------------|---------------------|---------------------|---------------------|---------------------------|------|
| Constant | 3.21 ** | 3.21 ** | 3.17 ** | | |
| Human capital | 0.930 ** | 0.79 ** | 0.80 ** | 1.00 | 1.00 |
| Relational capital | | 0.30 ** | 0.28 * | 0.93 | 1.07 |
| Human*Relational capital | | | 0.40 * | 0.48 | 2.08 |
| <i>R</i> | 0.54 | 0.62 | 0.66 | na | na |
| <i>R</i> squared | 0.29 | 0.38 | 0.44 | na | na |
| Adjusted <i>R</i> squared | 0.28 | 0.36 | 0.40 | na | na |
| <i>R</i> squared change | – | 0.09 | 0.06 | na | na |
| Sig. | 0.00 | 0.01 | 0.03 | na | na |

Notes: *Correlation is significant at the 0.05 level (one-tailed); **correlation is significant at the 0.01 level (one-tailed)

Discussion and conclusion

This research investigated and tested the interactive effect of intellectual capital dimensions on financial performance in Ugandan microfinance industry.

Relationships between intellectual elements and financial performance

Results have indicated that positive and significant relationship exists between human capital, structural and relational capital and financial performance in microfinance industry. This signifies that an improvement in intellectual capital elements boosts their association with financial performance. These findings are consistent with conclusions made by F-Jardon and Martos (2009), Bontis and Stovel (2002), Kulvisaechana (2005), Youndt and Snell (2004) and Abraham (2004). In a nutshell, it is thus proved and confirmed that positive association between human capital, structural capital, relational capital and financial performance exists in microfinance industry.

Predictive power of study variables

Overall, the research results indicate that all the three intellectual capital elements (HC, SC and RC) significantly impact on the financial performance of microfinance institutions in Uganda. Accordingly, individual intellectual capital elements of human capital, structural and relational capital account for a significant percent of variance in microfinance performance levels as depicted in Tables II-IV. In this case, structural capital, human capital and relational capital are true predictors or determinants of financial performance in Ugandan microfinance industry. These findings corroborate well with previous studies conducted by Bontis (2000), Wang and Chang (2005), Stewart (1997), Pfeffer (2000) and Uzzi (1996). The hypotheses *H1-H3* have been supported.

It was further established that the effect of human capital on financial performance differs as a function of structural capital and relational capital levels as shown in the Appendix, Figures A1 and A3. Besides, multiplicative terms in the regression models are both significant ($p < 0.05$). These results indicate that the magnitude effect of human capital on performance depends on structural and relational capitals; hence the assumption of nonadditivity is met (Jose, 2008; Bennet, 2000; Aiken and West, 1991; Friedrich, 1982).

In relation to findings in the Appendix, Figure A1, it is evident that performance increases as human capital and structural capital levels are increased. This implies that multiplicative effect of human capital and structural capital is significant in Ugandan microfinance industry. This depicts that combining the two elements will enhance or boost further the performance of MFIs and register higher performance than what one of the variables would have single-handedly registered. Thus, conditional hypothesis *H5* is supported. These findings are consistent with F-Jardon and Martos (2009) conclusions who argued that the impact of the structural capital on enterprise performance is important only when there is support of human capital.

Furthermore, significant multiplicative effect of relational capital and human capital on performance was established as depicted in Figure 4. This implies that the magnitude effect of one independent variable depends on the level of another independent variable. This signifies that the two must co-exist to influence performance in Ugandan microfinance industry. This finding corroborates Wang and Chang's (2005) observations, who argued that relational capital can influence financial performance if complemented by human capital. Other scholars like Welbourne (2008) remarked that human and relational capitals are intrinsically linked because it is people within the firm that create, maintain and nurture the relationship that contribute to firm performance every day. Similarly, Pfeffer (1994) and Uzzi (1996) recognized that human capital and relational capital play a very important role in enterprise performance and survival of the business. In addition, F-Jardon and Martos (2009) conclusions also support this finding and appreciate that human capital facilitates external relations with clients, suppliers and other agents in influencing firm performance. The findings of this study have therefore proved that interplay of relational capital and human capital is major in influencing performance of microfinance industry in Uganda and this supports *H4*.

In a related case, the multiplicative effect of relational capital and structural capital was not significant, thus leading to rejection of *H6*. Thus, there is no conditional relationship between independent variables (i.e. RC and SC) and financial performance in Ugandan microfinance industry.

Conclusion

In conclusion, the significant multiplicative effects of human capital and structural capital, and relational capital and human capital on performance confirm a spurious or conditional relationship; thereby satisfying *H4* and *H5*. Besides, the two interaction terms are nonadditive and their inclusion in the model gave rise to monotonic interactions (Bennet, 2000; Friedrich, 1982; Aiken and West, 1991). Since the interaction term between structural and relational capitals is additive; there is no more to consider than simply the main effects of each of the independent variable. The fact that some of the study results contradict empirical findings in the existing literature, the application of these study findings should be used with a lot of caution in other industries.

Implications for management and researchers

Theoretical implications

The study has addressed empirical issues or matters that have been all long not attended to by the literature more especially in microfinance industry. Also, the study has attempted to disprove or confirm whether the theoretical underpinnings are

empirically supported in microfinance industry. Consequently, the study has contributed to enduring intellectual capital debate in the field of business.

Although many scholars have different views on intellectual capital dimensions, this study has ascertained that it is a multi-dimensional predictor encompassing human capital, relational capital and structural capital, accounting for 62 percent of variance in intellectual capital. The study has therefore brought to light the true composition of intellectual capital in Ugandan microfinance industry.

In addition, the study has thrown more light on the multiplicative effect of intellectual capital elements on performance in the industry. Findings on multiplicative effect of intellectual capital elements on financial performance in microfinance institutions have thus shown the substance of different intellectual capital combinations or blend; thereby enabling this study to address the confusion or contradictions that exist in the literature. Over all, the most viable intellectual elements that can create value and promote growth in Ugandan microfinance industry is a blend of human and structural capitals ($HC \times SC$) and relational and human capitals ($RC \times HC$).

Managerial implications

First, the study has introduced a clear understanding on the effect of intellectual capital elements on performance in microfinance institutions. This promotes management efforts of MFIs to improve business performance, which can be facilitated through the appropriate management of leading elements of intellectual capital in advance and input more resources in most important elements. Thus, management can intensify initiatives to encourage greater understanding and acceptance of intellectual capital mix that boosts performance in Ugandan microfinance industry.

The managers of microfinance firms need to appreciate that the rise of intellectual capital in the industry is inevitable, given the competitive and technological forces that are sweeping the modern world. More importantly, current and future managers must know that a modern company changes so rapidly that every thing is dependent on its talents, the dedication of its people (human capital), the quality of stock of knowledge (structural capital) and the strength of networks with its stakeholders (relational capital). It is therefore high time that microfinance firms changed their management styles and traditional valuation models that do not include intellectual capital as a major component otherwise, the true value of a microfinance firms will never be uncovered.

In order to boost the wealth of microfinance institutions in Uganda, management should endeavor to find and employ a viable intellectual capital mix or composition that increases firm value. Microfinance industry's emphasis on intellectual resources would enhance increased efficiency and effectiveness of firms. The fact that all interactive terms involving human capital have been found to be significant and hence nonadditive, emphasis should be put in cultivating human resources because they make viable combinations of intellectual capital resources.

These findings also hold far-reaching implications for Accountants and accounting professional in particular. The profession should seize the opportunity to assist with the measurement and auditing of what makes companies valuable. Rather than the historical and supposedly objective approach that has characterized financial reporting to date, valuation of intellectual capital requires immediate and precise measures (Fairer and Stainbank, 2003).

Limitations of the study

The findings of this study are subject to some limitations that provide the initiatives for future research; and some of these include:

- One of the possible reasons for the varied results of the study is the methodology used for measuring intellectual capital. Although the constructs have been defined as precisely as possible by drawing relevant literature and validated by practitioners, the measurements used may not perfectly represent all the dimensions.
- Future studies could use the same basic hypotheses and regression construction, but implement the study in terms of a longitudinal rather than a cross-sectional design. The longitudinal study would need to correct changes in data relative to time element. Despite possible limitations of using single-period data, the results of the present study provide valuable insights into the effect of intellectual capital on microfinance firms' financial performance.

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Figure A1.
Interaction effects of structural capital and human capital on financial performance in microfinance institutions

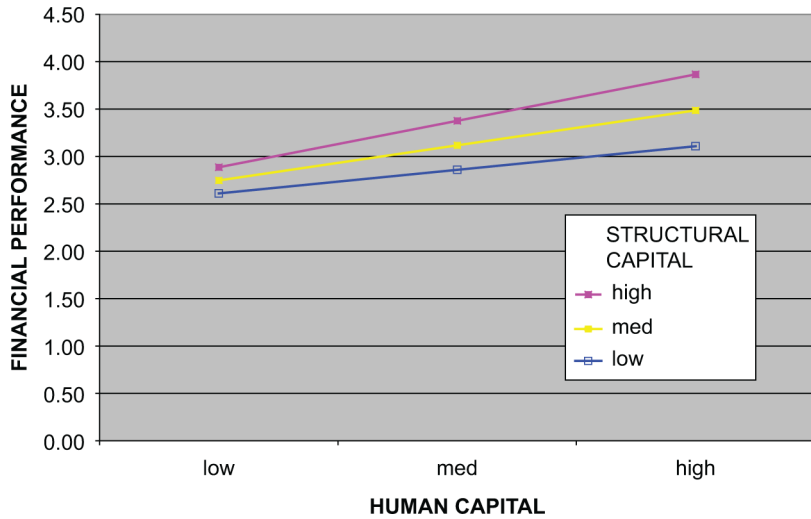
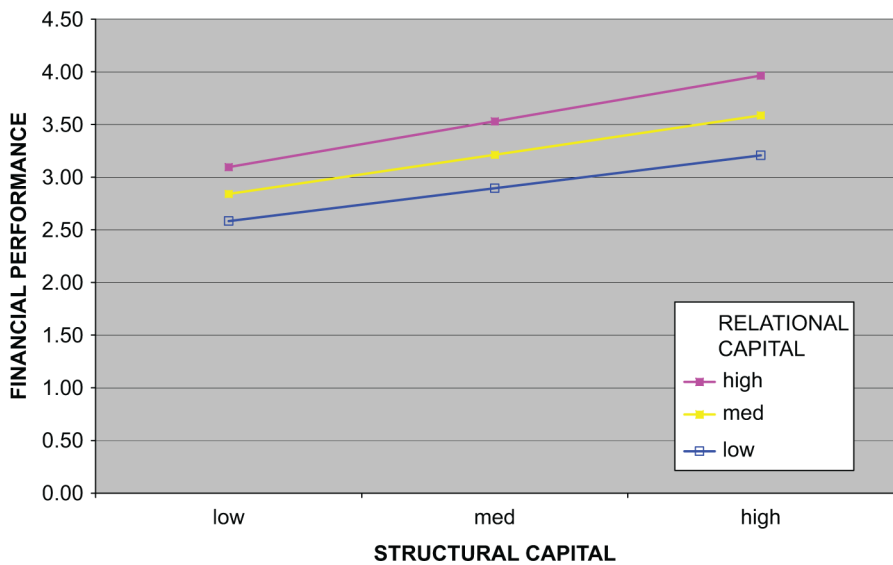


Figure A2.
Interaction effects of structural capital and relational capital on financial performance in microfinance institutions



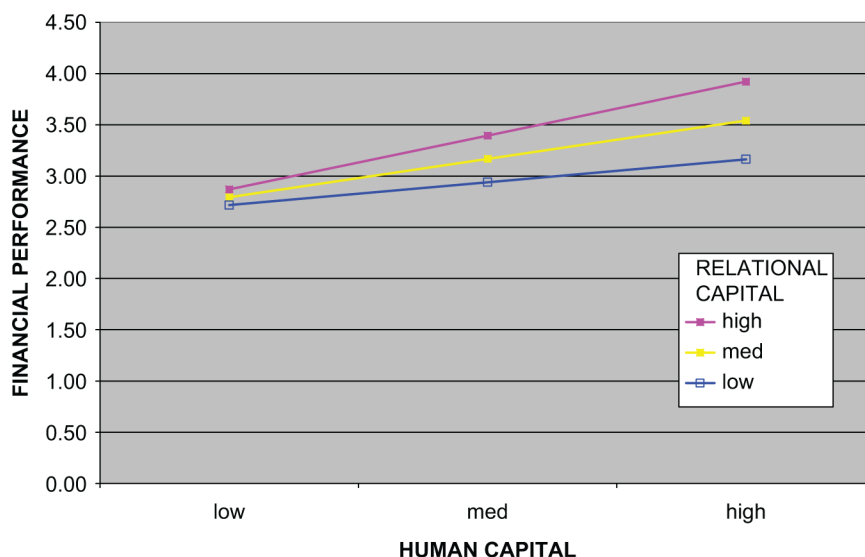


Figure A3. Interaction effects of human capital and relational capital on financial performance in microfinance institutions

| | Intellectual capital components | | |
|------------------------------------|---------------------------------|--------------------|--------------------|
| | Human capital | Structural capital | Relational capital |
| Working under pressure | 0.86 | | |
| Knowledgeable employees | 0.83 | | |
| Creative employees | 0.74 | | |
| Competent employees | 0.64 | | |
| Staff with high skills | 0.62 | | |
| Good at problem handling | 0.60 | | |
| Clear structures in the firm | | 0.88 | |
| Staff complement each other | | 0.78 | |
| Staff are in touch with each other | | 0.72 | |
| Teamwork exists in the firm | | 0.63 | |
| Firm processes are fast | | 0.61 | |
| Firm has networks with others | | | 0.87 |
| Employees are committed to clients | | | 0.64 |
| Mutual trust exists between firm | | | 0.62 |
| Have many channels with clients | | | 0.61 |
| <i>Eigenvalues</i> | 5.07 | 1.78 | 1.29 |
| Percentage of variance | 27.38 | 20.95 | 14.15 |
| Cumulative percentage | 27.38 | 48.33 | 62.48 |

Table A1.

Notes: Extraction method: principal component analysis: KMO = 0.76; Determinant of matrix = 0.002

Factor results: intellectual capital

| JIC 11,4 | Financial performance | | Components |
|-----------------------|---------------------------------|---------------|------------|
| | | Profitability | |
| 574 | Returns on assets | 0.92 | |
| | Returns on equity | 0.85 | |
| | Profit margin | 0.80 | |
| | Yield on portfolio | 0.78 | |
| | Non-performing portfolio | | 0.81 |
| | Operating expense to loan ratio | | 0.78 |
| | Firms' write off ratio | | 0.73 |
| | Debt to equity ratio | | 0.69 |
| | Portfolio at risk ratio | | 0.67 |
| | <i>Eigenvalues</i> | 3.91 | 1.95 |
| | Percentage of variance | 33.80 | 31.31 |
| Cumulative percentage | 33.80 | 65.12 | |

Table AII.

Factor results of financial performance

Notes: Extraction method: principal component analysis: KMO = 0.75; Determinant of matrix = 0.010

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