
Toward Prosocial Microfinance and Crowdfunding Campaigns Using Inclusive Natural Language Processing

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Abstract

Prosocial microfinance institutions have struggled to scale up their efforts toward alleviating poverty while continuing to reach the suitable borrowers without overburdening them with debt. Peer-to-peer crowdfunding organizations try to address this challenge by connecting socially conscious lenders with small-scale entrepreneurs through storytelling. Prior studies described such storytelling as a powerful source of knowledge managed to determine whether a microloan proposal is attractive to potential lenders and ultimately funded. Researchers also devised important categories into which they screen the language within the borrowers' narratives to indicate the prevalence of certain keywords in the stories. To further examine the impact of the borrowers' stories on the likelihood of speedy and successful funding, this paper reviews relevant research and practice and suggests applying natural language processing in a bottom-up approach, where the entirety of narratives is considered for holistically managing information within the narratives and producing the storytelling themes organically, without preconceived categories. This might help aspiring small-scale entrepreneurs and their potential microlenders find the right fit quicker, reducing the opportunity cost and making crowdfunding campaigns more successful.

Keywords: natural language processing, information management, small business loan, Kiva, knowledge management, microfinance, crowdfunding, poverty, prosocial lending



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INTRODUCTION

Poverty and economic inequality have plagued societies for ages. Through entrepreneurship, individuals have been able to break the cycle of poverty and experience intergenerational economic mobility (Boudreaux, 2014). However, at the outset, many entrepreneurs lack easy access to necessary capital as well as the means to develop an enterprise (Berger & Udell, 1995). Microfinance institutions try to alleviate this hurdle by supplying microloans that support the local economy and potentially reduce the prevalence and severity of poverty (Mushtaq, Rizwan, & Bruneau, 2019). A key challenge in this worthy enterprise remains with the screening of diverse storytelling loan proposals for potential viability and, importantly, their attractiveness to small-scale, socially conscious investors.

Microfinance was first proposed in 1972 by Nobel Prize winning Muhammad Yunus who founded Grameen Bank. Grameen Bank works on the principles that (1) poverty is institutional and (2) charity creates a dependency problem, which is not a sustainable solution (Yunus, 2004). Yunus was determined to create a program of microloans that focused on empowering communities economically, leaving them less reliant on charity-like aid programs. These microloans are based on the notion that smaller loans can have a greater impact in poorer communities where credit may not be readily available due, in part, to lack of credit history, collateral, and the low margins associated with smaller loans. Access to credit allows individuals living on slim margins to obtain the means to supply a more sustainable living for their families, building intergenerational wealth, and to bring economic opportunities to their communities (Otero, 1999).

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These microloans have a ripple effect in the local economy. If a small business owner gets the funds that they need to start and grow their business, they can hire employees, supply needed services to the community, and increase the local tax base. Over time, this growth could contribute to improvements in community infrastructure, expanding access to healthcare, education, and basic needs. Thus, by this model, the need for a consistent flow of international aid decreases over time (Hulme & Mosley, 1996). If the loans are paid back, the nonprofit microfinance organizations will have a revolving fund that allows them to use the proceeds from one loan to issue another loan (Sengupta & Aubuchon, 2008). This has a multiplying effect on initial donations and leaves organizations less reliant on a consistent flow of philanthropic funds.

Many microfinance institutions followed Grameen Bank's lead by extending small loans to those in developing countries who are underserved by traditional financial services. However, these institutions have struggled to find the balance between sustainability and impact. Many banks have focused on larger and less risk-averse loans because they produce more income. Microloans are often uncollateralized, which means that the risk of default is high, profits are often low or nonexistent, and the amount of time it takes to underwrite and service a loan is cost prohibitive. For-profit microfinance institutions have brought more capital to the space, but it came with new challenges. Some banks profit through microfinance by charging high rates and offering little guidance to the borrowers. Critics have raised concerns that the improper due diligence, lack of training, and high rates might put borrowers on a debt "treadmill," leaving them worse off (Cull et al., 2009).

Online crowdfunding can mitigate the risk inherent in microlending. This model provides a platform to tell the stories that do not often get told with a traditional credit score. Peer-to-peer crowdlending is lower in cost and appeals to a wide audience of potential lenders, which helps disperse the risk. A San Francisco-based Kiva, for example, is one of the largest microfinance institutions in the world, reaching millions in need of access to small-business capital with their crowdlending platform. It is one of the non-profit, peer-to-peer microlending platforms where borrowers can tell their story to appeal to the philanthropic side of lenders across the world. The word Kiva means 'unity' or 'agreement' in Swahili. Kiva works with local microfinance institutions, called *field partners*, who perform the due diligence on the borrowers, as field partners, for instance, have an overall wider access to the poor in need of microloans. Some field partners also provide technical assistance and other services while maintaining this key relationship with Kiva. Without the field partners, many borrowers would not usually have access to the internet or translation services to tell their story to the broader community.

Loans featured on Kiva can be funded in as little as a few minutes or linger for up to several months on the platform, but in the end, the loans are funded at a rate close to 95%. If a loan is on the platform for too long, then the lender's money is refunded, and the loan is designated as expired. Field partners pre-disburse loans and then upload the borrower's story onto Kiva's platform. Lenders on Kiva are typically non-profit oriented and philanthropically minded, so they will often not seek returns beyond the principal, but field partners do charge interest to the borrower. Because the loans are disbursed already, these field partners take on the risk of a traditional finance institution, even though, per Kiva, the loans are repaid by borrowers at a rate close to 97%. This model of screening, pre-disbursal, and then further funding - adopted between field partners and Kiva - is typical in the banking world, as many loans are packaged together and then sold to an intermediary to enhance and mitigate cost associated with the risk of a loan.

A number of studies attempted to examine the management of information that crowdlenders receive and to assist them in making good decisions for their business models. Even though the ultimate success rate for these loan proposals is relatively high, the speed with which they are evaluated and funded - and their attractiveness to potential lenders - is key to reducing the opportunity cost for all involved. Because the knowledge generated in this process is of different sub-types of explicit and tacit, its management should necessarily incorporate the emergent themes or categories from qualitative descriptors in the borrowers' narratives. As some scholars look into defining language categories and then applying the keywords from loan applications to these categories (Allison et al., 2015), others remind us about the value of not losing the holistic nature of context in which stories are located and, for example, capturing

this tacit value through transferring the essence of knowledge in authentic storytelling (Wijetunge, 2012). Our article contributes to these worthwhile pursuits for helping those in need through a synthesis of relevant concepts, unpacking of practice-based examples, and furthering an applied research angle to broaden the language base from which narrative themes emerge in a more inclusive way of capturing the essence of microloan storytelling.

A REVIEW OF THE FIELD

Microfinancing the Social Good

Microfinance is a promising, if imperfect, solution to alleviating poverty. It can be difficult to scale, and there is a risk of putting vulnerable populations on a kind of debt “treadmill.” However, historical success of microfinancing, coupled with modern innovation, allow for an optimistic outlook in this socially responsible lending space. Microfinance is not a novel idea, with its roots dating back to the 1800’s, when Lysander Spooner theorized an alleviation of poverty by dispensing microcredits to entrepreneurs and farmers (Garrity & Martin, 2018). It came into focus in 1976 when Muhammed Yunus, a well-known economics professor, felt compelled to put theory to practice after studying how basket weavers were forced to take usurious loans trapping them in a cycle of poverty. With a simple loan of \$27 Yunus was able to pay off the obligations of 42 people that were otherwise unable to rise above their means. From these meager beginnings, the idea of Grameen Bank began smashing the notion that the poorest of the poor were not creditworthy (Gajjala et al., 2011). Yunus had a vision for poverty alleviation that focused on self-help instead of direct income redistribution (Cull et al., 2009).

The efficacy of microfinance has been studied extensively and is believed to be one of the best ways to alleviate poverty (Westover, 2008). Khandker (2005) performed an extensive panel data study in Bangladesh showing that microfinance helps not only individual borrowers but also their community. Additionally, Khandker was able to demonstrate that participation in microfinance was associated with a 20% decline in the poverty rate among participating households and with a significant increase in per-capita consumption for both participants and nonparticipants. Garrity and Martin (2018) showed that multigenerational poverty can be broken with demanding work that can greatly help future generations. The impact of microfinance reaches far beyond the borrowers and their lives. If people have more means than just for bare survival, they can plan for tomorrow; invest in education, and in their health. It ultimately helps their community being less dependent on international aid. Microfinance initiatives can even make access to healthcare more affordable as well as improve nutrition and empower women (Khandker, 2005). Furthermore, more children go to school with longer enrollments (Morduch, 1998). A Credit Summit study in 2020 found that, of almost 140 million borrowers served in the microfinance industry, two thirds were living in rural areas not traditionally served by the banking industry and, of all the borrowers, four out of five were women.

Microfinance institutions could not thrive with a traditional financial business model due to the low margins and prohibitive cost. Thus, the industry relies on subsidies, direct help, preferential treatment, non-profit status, or government intervention. Governments have traditionally stepped in when it came to agriculture loans or even banking in rural areas. However, when state-run banks filled in the gaps, financing was found to be ineffective and poorly run. Many times, interest rates were well below market rates, and collecting on the loans was ineffective (Conning & Udry, 2007). Many microfinance institutions rely on charity of donors to subsidize their efforts. This obstacle poses several impediments especially when scaling operations, appealing to investors, and fostering long-term sustainable success (Fehr & Hishigsuren, 2006). Kiva generates two thirds of its operating cost via donations from lenders, and the rest of the operating cost is covered by institutional donations. When each individual loan is completed, for example, Kiva includes an option to add a 10% donation to the loan to help with the operating cost.

The for-profit microfinance industry has stepped in to take advantage of the market, especially as the industry becomes trendy with popular politicians (e.g., Bill Clinton) and other celebrity types extolling its benefits. Unfortunately, the industry is ripe for exploitation of needy borrowers who have few options and even less financial literacy. Banco Compartamos is one of the biggest microfinance institutions in Latin America, but they have been found to charge interest rates as high as 94% per year on loans (Cull et

al., 2009). Additionally, building relationships with borrowers, while time consuming, is more effective than traditional credit scoring, especially for small businesses that may not have close relationships with bankers (Frame, Srinivasan, & Woosley, 2008).

Crowdlending/Fintech

Crowdlending through financial technology (i.e., fintech) has entered the microfinance marketplace to leverage the internet, with peer-to-peer lending allowing individuals to bypass banks and other traditional finance institutions. Lenders have an unprecedented opportunity to make a difference with their money by donating directly to the projects with which they feel a connection. This ability to connect on an emotional level allows borrowers with the greatest need to reach their social goals without having to emphasize the financial bottom line. Peer-to-peer lending democratizes the access to capital by making it available to anyone who has a connection to the internet. A study by Maier (2016) has shown the remarkable growth of crowdlending from \$150 million in 2010 to \$10.1 billion in 2015 on two of the biggest platforms.

The peer-to-peer lending model allows for lower cost while granting lower interest rates and fostering more scalability. The market also allows smaller loans and more diversity thus helping more people. More studies would be needed to flesh out the actual final costs and efficacy of the platform if in fact peeling back the layers of bureaucracy is an effective solution (Gajjala et al., 2011). Drawbacks to peer-to-peer lending include risks due to the inherent information asymmetry and some blind trust in the process that is not easily quantified (Wang & Greiner, 2011).

Moral Hazard

The distance and dissociation of the borrower from the lender poses a tenuous situation not seen in the traditional financial model where bankers get to know their customers in a professional relationship. Risk is calculated into the equation of interest rates and exposure that the banks choose to take when they disburse a loan. The borrower may be inclined to make riskier decisions knowing they are covered by another party incurring the cost or even take more drastic steps to pay back the loan knowing they are leveraged with an obligation, which is referred to as moral hazard. Moral hazard increases when any party enters an agreement in bad faith, when parties act contrary to the first contract terms, or when one party assumes added risk at the expense of the other party (Kenton, 2020).

Measuring a business by credit score can be a poor indicator of loan performance in that lenders are more willing to make riskier loans if the interest rate payoffs are too enticing (DeYoung, Glennon, & Nigro, 2008). How persistently lenders collect on the loan, and to what standard the borrowers are held, is up to the institution. Since most microfinance institutions are non-profits, typically based on donations, the standards for a "normal" return on investment, as compared to the for-profit model, are up to the individual institutions as well. These subsidized loans and the diminished direct ownership of funding can deform typical incentive structures, bringing the feasibility of the entire model into a precarious situation (Wisniwski, 1999). Given the atypical relationship in the microfinance model – with due diligence up to the individual agents in the field – novel organizational structures and uneven ad hoc strategy implementation need to be further explored to mitigate the risk of moral hazard.

A Case in Point

Kiva keeps the moral obligation to ensure it is lending to borrowers that can afford the loan and have a semblance of buy-in, so that they are likely to pay back their obligations. Kiva offsets its liabilities by keeping relationships with the field partners – who perform the due diligence for potential borrowers – while keeping its own obligations to the lenders, other stakeholders, and the communities they serve. Kiva preserves its non-profit status by not charging directly for the loans but collecting interest on funds not yet distributed as well as collecting donations, both institutional and individual.

The Kiva process is simple in its essence that they can move beyond the traditional financial institution relationship. Kiva offers greater representation of the borrowers who have greater control of their negotiating power with access to a larger lending pool. This direct communication from field partner and

borrower to a larger lender audience facilitates an unprecedented flow of information not necessarily available pre-internet (Gajjala et al., 2011). Per co-founder, Jessica Jackley, “Kiva is fundamentally about stories. These stories are what connect lenders to entrepreneurs, and they have the power to create an interaction based on dignity and respect and partnership, not one focused on suffering or pity or the need for a wealthy donor to swoop in and single handedly save the day” (Aaker & Chang, 2010, p. 1).

Jackley had traveled to East Africa where she met some entrepreneurs that she thought had compelling stories she wanted to share with her friends and family. Jackley saw firsthand the impact small donations could make in the world of the impoverished. She started with a small goal to empower some of the people she met on her travels and develop a few small businesses. As her idea grew, she was able to make a greater impact putting the stories of these people front and center on the Kiva platform, connecting to viewers around the world. Now her goals have broadened to include changing the way entire generations view the poor in other countries by not focusing on the sad stories but pivoting to the challenging work of entrepreneurs to assume that a better, more positive future is possible. She said: “I think this change of mindset is what changes the world-when people think of each other differently and really deep down in their gut believe that more is possible for another human being, that’s when truly incredible things begin to happen” (Aaker & Chang, 2010, p. 12).

Maximizing the Impact of Storytelling in Microloan Proposals

Entrepreneurs need a way to signal to potential lenders that they have a project or an idea that is worthy of an investment, and most often is up to them to tell their story. Maximizing impact and finding the right words to create sustainable growth can directly help those in need, while scaling the impact so that more people may be helped. Peer-to-peer platforms supply an ideal solution to facilitate these stories, but there must be an efficient and effective way to go about the narration process and assessment as well as comparing the language in the funding proposals, or the system’s viability may come into question. Allison et al. (2015) studied these narratives and found that the most effective way to get an opportunity funded was by framing the venture as helping others and less so by emphasizing a business opportunity. To further maximize the impact of these platforms in reaching more people, a tipping point must be met where there are enough lenders to give out loans as well as enough borrowers to appeal to the lenders. Borrowers need more flexible sources of funding, quicker access to those funds, efficiency in dealing with bureaucracy and security. Lenders need a broad spectrum of appealing loans either based on their philanthropic tendencies or their personal economic performance requirements (Maier, 2016).

The variety of words used in a borrower’s profile conveys a message that can be of critical importance for whether a loan is funded. It is therefore interesting to study the types of opportunities that are more likely to be funded. Gajjala et al. (2011) note that the typical lender across the globe is from the middle class, and it is difficult to perceive giving on the Kiva platform as more than charity. Furthermore, this charitable giving’s instant gratification seems to be a replacement or modern equivalent of faith-based missionary work. The typical lender is looking to choose stories that appeal to their beliefs, align with their altruistic tendencies to help those in need, or take care of others.

Some of the loan proposals with the most positive outcomes were when loan descriptions held words that were associated with family (i.e., children, home, married, community) (Yin & Shen, 2016). Invoking a reader's empathy correlates with getting a loan funded quickly, where the anger, sadness in a present situation, for example, conveys a real need and an opportunity to overcome (Pengnate & Riggins, 2020). Reasons for choosing which projects to fund can range from objective evaluation of project merits, personal affinity bias (Galak et al., 2019), or even subjective values. Lenders seem to prefer loans that have low entry costs, borrowers that have capital constraints, thus the loans that finance education or health projects are the fastest funded (Ly & Mason, 2012). Furthermore, lenders typically have motives to fund projects for poverty alleviation, financial stability, and funding the poor. A key question for both the lenders and borrowers remains about the structure and orientation of a proposal’s narrative for successful funding.

NATURAL LANGUAGE PROCESSING TO THE RESCUE

Traditional ways to measure creditworthiness in many developed nations involve a credit score, which is a contributing indicator for assessing potential risk of the borrower as well as how much interest to charge on a loan. A credit score is based on credit reporting not typically available in developing countries. In these developing countries, it would be prudent to develop nontraditional ways to signal to potential lenders that a borrower is deserving of a loan. With the advent of machine learning in the digital age, a more involved analysis can be performed to quantify qualitative data and to perform econometric research to give further context to broader empirical content.

To process loan description narratives, researchers may take advantage of machine learning algorithms such as Word2vec and Doc2Vec. The main theory behind the Word2Vec algorithm was explicated by Mikolov et al. from Google in a paper published in 2013. These researchers maintain that since certain words share certain context it is possible to learn vector (i.e., directional) representations of words to better quantify the relationships within those words. A classic example would be if one were to take the vector dimension for the word "King" then subtract "man" and add "woman" the result would be "Queen." Doc2Vec takes advantage of Paragraph Vector – an unsupervised algorithm (i.e., no predetermined concepts/categories for the emerging word patterns) that can learn vector representations on word-processing documents of varying lengths, which helps to give context to the words used in a sentence or a paragraph (Le & Mikolov, 2014). In this way, researchers can incorporate tags of the 'STATUS' variable where loans are categorized already as 'funded', with the full amount of the loan secured, or 'expired' (i.e., where the loan did not reach its goal).

To further the semantic analysis as well as to help to verify the results, a software such as Leximancer can be used to analyze the loan proposals' text narratives. Leximancer uses latent semantic analysis which analyzes the relationship between words in a document to develop concepts in the terms used. Leximancer creates a document matrix tracking the frequency of words used and building these keywords as concepts and themes. The frequency of the keywords is weighted on how often they appear in relation to the focal concept. Themes are then developed from concepts that appear frequently in the document (such as in Aryal et al., 2018) – instead of fitting the keywords into predefined categories – for a more inclusive approach to capturing the essence of loan-seekers' stories.

The applications of machine learning are constantly growing. Pham and Shen (2017) were some of the first to perform a deep-learning, natural language processing analysis on Kiva's data – to continue with our case in point – and found that grouping borrowers to mitigate moral hazard was effective in speeding up loan funding time by an average of 3.3 days. Nowak, Ross and Yencha (2017) found that loan descriptors can be an effective way to forecast the performance of a loan through Lending Club, a peer-to-peer lending platform. Yin and Shen (2016) were able to "train" recurrent neural networks on Kiva loan descriptions – using machine learning – to help predict if a loan would be funded quickly. The motivation of lenders drawn to the Kiva platform has been studied as well, using human coders to categorize self-stated lending behavior with machine learning classifiers. Liu et al. (2012), for instance, were able to make recommendations to Kiva about the type of lender that is drawn to the site and showed that joining a Kiva team of like-minded lenders led to increased engagement. It seems that a bottom-up approach to analyzing the narratives, where the data (i.e., all words within the story) drive the emergence of themes, would more authentically represent the borrower's intent and capabilities and give lenders more confidence in understanding or evaluating the feasibility of each microloan proposal.

CONCLUSION

The worthy and socially responsible causes for deploying business tools to help in alleviating perpetual cycles of poverty can be assisted by information and knowledge management, including natural language processing. With numerous socially conscious partners entering the entrepreneurial space of micro-level crowdfunding, their foci diverge from quantitative measures of a loan proposal's viability to qualitative assessments and intuitional predictability of failure. Thus, a spectrum of information and knowledge management conceptions and approaches – from catering to the traditional "mind-as-machine" (Wiig, 2004, p. 63) dictum to considering transpersonal contexts (Avramchuk, 2020) – should be

harnessed for the benefit of all stakeholders involved in the process and management of crowdlending. This review article attempted to synthesize the field's key concepts, analyze them through an example of one of the largest industry players, and highlight a further applied research direction in making natural language processing more inclusive of what the borrowers in need express in their authentic storytelling.

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