FinCare – A Digital Spending Conscience or “Do you really need a flamethrower?”

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Abstract

Cashless payments are on the rise as technology advancements enable new and more convenient ways of payment. With the decrease in cash payments and an increased ease of paying online or by credit card, consumers do not feel the “pain of paying” anymore. Certain situations might tempt consumers to adverse impulse purchases. Many applications already leverage user profiles to create individual experiences tailored to the user. Knowing the user’s current context can be used by a system to detect anomalies in behavior and warn the user. We propose a family of systems that evaluate purchase intentions based on the current user situation. The user will be notified about adverse impulse purchases and unusual behavior, so that s/he can cancel these transactions. The paper illustrates a possible system design along with corresponding use cases.

Keywords

FinCare, FinTech, Context-awareness, Spending Behavior.

Introduction

Within just 100 hours 20,000 people bought a flamethrower from Elon Musk’s Boring Company at a price of $500 each (CNN 2018). Clearly, such an affective purchase was also influenced by the ease of executing the transaction. In the EU, the number of cashless payments is expected to increase by almost 50% (or 9% p.a.) from 2015 to 2020 and the share of cashless retail transactions is estimated with 40% (AT Kearney 2013). The temptations to buy things have never been so high while the effort to pay for them has never been so low.

Any transaction is a trade of money for a good or a service. The perceived value of the purchase is greater if it is paid for with cash taken out of the wallet than if the payment is digital and done by a single click (Shah et al. 2016). Studies have also shown that consumers are more committed to their purchase and enjoy a greater emotional attachment with their purchase if they paid with cash rather than with credit card (van der Horst and Matthijsen 2013).

As the trend of increasing cashless payments continues (Wheatley 2017), the “pain of paying” decreases and more spending becomes less conscious (Rick et al. 2007). Those impulse purchases that are facilitated by the ease of paying, but would not be executed in presence of transactional friction, could be classified as adverse spending decisions.

Many services, such as Google, Amazon, or Spotify provide the user with an enhanced individual experience based on the user’s preferences and behavior. Similarly, spending decisions could be evaluated under consideration of the profile of a user and the user’s current situation. This would allow to prevent adverse impulse purchases by introducing artificial friction, which naturally exists for cash payments.
Therefore this paper addresses the research question: How can a context-aware system support the user by preventing adverse spending decisions?

The remainder of the paper is organized as follows. In Fundamentals we give a brief description of the research areas FinTech and context-awareness. The section FinCare describes our approach and potential use cases. The section Challenges states potential road blocks. It is followed by Conclusion and Outlook.

Fundamentals

Our approach applies the concept of context-awareness to the area of individual spending behavior. For the application of technology to financial topics the term FinTech has been coined. This section gives a brief explanation of the basic terms FinTech and context-awareness.

The term FinTech describes “a new financial industry that applies technology to improve financial activities” (Schueffel 2016). Business functions that are affected by FinTech include financing, investments, payments, and financial advice (Puschmann 2017). Most services/products have a technological focus to enable or improve certain financial interactions. To the best of our knowledge, there is a lack of services/products that focus specifically on the individual user and her/his current situation.

Context-awareness describes the use of context to provide task-relevant information and/or services to a user (Dey 1999). Context is a well-researched topic and is used in many applications, e.g., location based service, organizing photos by time, location and depicted persons, fitness trackers, etc. Sensors, preferences and machine learning enable applications using a user’s context.

FinCare – The Digital Spending Conscience

We envision a family of services to support the user in her/his financial activities by utilizing context-awareness. As these services provide care to individuals in a financial context, we propose the term FinCare to describe this research area. Members of this family can be as simple as a threshold on a bank account where the online banking warns the user if a transaction is exceeding the threshold or as complex as an application that considers the user’s spending behaviour, possible distraction or stress, and analyzes every transaction from online shopping, trading and the like.

In this paper, we illustrate a possible instance of a FinCare system that relates spending intentions to the current situation of the user and intervenes in case of adverse impulse purchases.

System Design and Functionality

Our approach is based on three basic assumptions.

1) Transactions can be tracked in real-time. Recognition needs to happen upon initiation of the payment, in order to be able to intervene in the transaction process. This can be realized by intercepting traffic in a banking app, such as Quicken or WeChat, and performing a conformance analysis before passing the request to the back-end.

2) For all payments the nature of the payment can be identified instantly. In order to evaluate transactions and make an accurate judgement, the system needs to know what the transaction is about. As one example, some of the WeChat Pay features, such as QR Code Payment or In-App Payment already allow this.

3) The system is able to assess the current situation of the user based on a broad context analysis, whenever a payment is initiated. Smartphones and smart home systems are real-life examples of devices and systems that gather a broad range of context information and enable context-aware services (Perera et al. 2014).

Figure 1 illustrates possible components of the system and its workflow. A context component is responsible for gathering context and inferring the current user situation (see for example Su et al. 2014). To realize this, the middleware presented by Gu et al. could be used for context modelling (Gu et al. 2005). A transaction component monitors all transactions and intervenes when necessary. An evaluation component evaluates spending decisions based on knowledge about the user, the current situation, and
past transactions. This knowledge is stored to also improve evaluations over time. Whenever a purchase happens, it will be evaluated under consideration of the current situation. A set of customizable rules and limits together with a profile of the user’s spending behavior will be used to determine whether the purchase is considered to be an adverse spending decision.

The proposed system uses the data that is collected over time to learn about the user’s behavior and preferences. Machine learning techniques, such as the k-nearest neighbors algorithm or neural networks, can be used to identify spending patterns and characteristic spending situations. This gathered intelligence is then considered for future evaluations.

A purchase might be classified as an adverse decision for different reasons. Examples could be: A rule for the current situation is violated, a budget limit for the current context is exceeded, or the user deviates from typical spending behavior in similar situations. It is critical to have context information that allows to correctly identify the nature of the transactions. If at least one of these events is detected, the system will alert the user, i.e. it acts like a digital spending conscience.

Periodic analysis will present spending statistics to the user to raise awareness for general spending behavior and the accumulated value of smaller spending decisions. From this analysis different savings opportunities might be derived and suggested to the user.

**System Use**

For initial setup of the proposed system, the user will be guided by a wizard to configure her/his profile and preferences. These configurations should include, but are not limited to birthday, gender, life situation, risk aversion, hobbies and interests, budgets/limits. Also, the system needs to be linked to the user’s bank account and relevant payment services, such as credit cards or PayPal, to track and interact with the transactions.

By specifying rules and budget limits for certain situations, the system can be tailored to the individual needs of the user. A supervised learning approach can be used for continuous improvement of the system’s judgement: The user can go through a feedback loop and categorize past spending decisions as adverse or non-adverse decisions.

The proposed system runs in the background and does not require explicit input from the user. Incoming payment requests will be evaluated based on the current situation as well as the defined and learned parameters. For purchases that are identified as non-adverse spending decisions, the system will remain silent and continue to run in the background. If the system evaluates the intended purchase to be an adverse spending decision, the payment is blocked and the user receives an alert. The user can then choose to agree with the system’s evaluation result and cancel the transaction. It is also possible for the user to proceed with the purchase despite the evaluation result. Alternatively, the user might be able to postpone certain decisions to give more thought to the purchase and decide under more adequate circumstances.

Statistics and reports on the user’s spending patterns allow the user to reflect on her/his own behavior based on tangible facts. This will raise awareness for unconscious adverse spending decisions.
Use Cases

To illustrate the potential of our proposed system, some specific use cases are described in the following. Each use case presents a certain setting together with how the system could support the user. For all use cases a common general context can be relevant. This relevant context includes: bank account balance, monthly income, time (time of the day, weekday, month, season etc.), location, life situation (job, relationship, children, health status, age, living situation, and wealth level). For different use cases other specific aspects of context might be relevant to adequately evaluate the situation. These additional aspects are mentioned in the following with the corresponding use case.

Web-based Shopping

The user watches TV while visiting different online shops. Watching TV distracts her/him from the activity of shopping. TV commercials might create spontaneous interest for certain products and impulse purchases are facilitated by the ease of digital payment. Whether the user actually needs the product and would also have ordered it in a different setting is not considered in the process.

In such a situation the relevant context could include level of distraction, mood, tiredness, on-going sales and discounts of online shops, and parallel activities. If the system detects a high level of distraction, a sudden excitement, an active sale on the website, and/or a time late at night, it could alert the user that her/his spending decision might be adverse and could be driven by the current situation. The user can then choose to cancel the transaction.

Investments in Capital Markets and Other Assets

The user hears about Bitcoin from a friend. S/he then reads a blog article about Bitcoin where a positive outlook on profits is given. This encourages her/him to buy Bitcoins without further research. The user does not have any investment experience and does not have any investments in other financial assets.

For this decision, the relevant context should include investment experience, existing investment portfolio, risk aversion, activities, consumed information, mood, and level of distraction. In this situation the system would recognize that the user wants to make her/his first investment without further research. It would also consider that Cryptocurrencies are rather speculative investments and might not fit the user’s risk aversion. Accordingly, the user would receive an alert that this spending decision seems to not be in line with her/his preferences and previous experience. S/he might agree and cancel the transaction.

Aggregated Micro Payment Analysis

For some purchases, such as food, drinks, and taxi rides, or for long-term commitments, such as gym memberships and phone plans the point of no return might be exceeded at time of payment. However, the system will present the user with a comprehensive periodic analysis of past spending decisions. Such a payment summary will raise awareness for general spending behavior and especially for the accumulated value of small purchases. This data will also be the basis to derive saving potentials for different situations, such as refraining from buying take-out breakfast every day. The user can then specify corresponding alerts to prevent such purchases.

Discussion

The three basic assumptions of the approach might pose a challenge. Even though WeChat Pay presents a real-life example in support of assumptions 1) and 2), local regulations might make it inapplicable in certain regions. Context availability could be another issue, when it comes to specialized context, such as previous investment experiences of level of tiredness. In addition to existing sources of context new sources of context might need to be used to get this context information. Further design considerations for the system will need to assess which context information actually influences spending behavior.

For implementation, existing systems such as Mint.com or banking applications from traditional banks could be built on. Also, the available context, e.g. provided by the smartphone or smart home sensors could be leveraged. Integration of the different systems might pose a challenge and needs to be investigated.
The coexistence of cashless payments and cash payments, which cannot be considered directly, needs to be dealt with. However, the system might also track cash withdrawals and help the user to be aware of the amounts of cash withdrawn over time. With the decreasing use of cash this issue will become less critical.

As people are very cautious about personal data, especially their financial data, information security might also be a challenge. Perception and regulation of data security varies strongly across different countries. One possible solution could be the anonymization of data for evaluation.

Research on personal informatics has shown that an audience exists, that is interested in using data to achieve a better self-understanding (Epstein et al. 2015). Platforms for financial management such as Mint.com have existed for many years and experience a growing popularity as financial activities become more and more digital. Hence, we believe a group of potential users exist that would very much like to use technology to better understand their spending behavior and receive advice and alerts when necessary.

Conclusion and Outlook

In this new research area, which we describe as FinCare, technology is applied to provide individual support to the user concerning her/his financial activities. The goal of the proposed system is to reintroduce the disappearing friction (or “pain of paying”) of cash payments, but only in situations where it would actually benefit the user. By questioning certain spending decisions based on the current situation, our proposed “digital spending conscience” protects the user, while preserving her/his spending flexibility. If the proposed system was already implemented, most users would probably not be owners of a Boring Company flamethrower right now.

Future research will have to address several areas to validate the feasibility of the system. A design science research approach (Gregor and Jones 2007) will be the methodology for further design, implementation and evaluation of the proposed FinCare artifact. Based on an initial user study we will build an artifact and evaluate this again towards the user group. As the potential set of FinCare apps is large and depends on existing financial applications as well as on the possible context, we see a prosperous research area here.

References