Social Organization of Household Finance: Understanding Artful Financial Systems in the Home

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ABSTRACT

In this paper we discuss results of a field study focused on understanding the ways money and financial issues are handled within family settings. Families develop 'systems' or methods through which they coordinate and manage their everyday financial activities. Through an analysis of our fieldwork data collected from fifteen families, we provide several examples of such systems, highlighting their qualities and illustrating how such systems come to support the handling of financial activities in the home. Our results show that these systems are developed with a careful consideration of familial values, relationships and routines; and incorporate the use of physical and digital tools. Consequently, we suggest that design should consider the use and non-use of technology when supporting household financial management, taking into account the richness of families' existing organically formed practices surrounding financial systems. Finally, our findings point to the fact that financial management in the domestic setting is socially organized and is closely connected to supporting everyday household activities.

Author Keywords

Family, Finance, Ethnography, CSCW, and Design.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Money is an important but complex part of our everyday lives. The way we interact with money and reason about it has implications on our wellbeing. Our financial behaviors and attitudes are strongly affected and continuously shaped by social aspects, especially family and household dynamics. Family members coordinate, support, contribute and manage different issues that relate to money and financial activities. Although money and financial activities have an important place in people's everyday activities, the field of HCI has only recently become involved in this topic with some preliminary studies on personal finance [18, 45, 46] and recent workshops at CHI 2014 [17] and CSCW 2015 [21] conferences exploring financial aspects alongside other broader topics such as the use of pseudo currencies (e.g. Bit-coin, Bristol Pound) [9] and crowd-funding [10].

In this paper, we present findings from an ethnographic field study that is aimed at exploring how families come together in handling and managing their household finances. In particular, we aim to explore their nuanced and situated practices of creating and using household 'financial systems': an appropriated assembly of financial instruments such as spreadsheets, diaries, online banking, bookkeeping as well as many other domestic tools. We carried out a set of qualitative, contextual interviews with fifteen families in Australia. Building on the research of Vines et al. [46] and Kaye et al. [18], we found financial management to be an important part of domestic life and further explored how the nature of domesticity shapes and defines financial activities, and vise-versa. Through a detailed analysis of why such artful financial systems are created and how they are used, we show that the use of domestic financial systems extends far beyond generic finance-related activities such as, recordkeeping, setting up reminders, and controlling spending. In fact, these systems are reflective of the family values, relationships and routines. Our findings show a predominant use of physical tools such as handwritten spreadsheets, physical document organizers and folders, cash envelopes and so on. Although the use of online banking was quite prevalent, families rarely used any other digital tools to support their financial activities. Based on our findings, we suggest that design should utilize the natural practices of families and critically question whether technology is a solution [3, 34] in such cases.

In what follows, we outline the contributions of this work to the CSCW community, followed by a literature review from the fields of economics, consumer research and HCI. We then describe our field study and methods; followed by examples of financial systems we observed using these methods. We describe these systems in terms of their design and use within domestic settings and showcase the value our participants derived from them. In closing, we elicit important properties of these systems to outline some implications for design in this area.

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Contributions to CSCW

The contribution of this work is threefold.

1. *Empirical findings on coordination over family finances.* Using an ethnographically informed approach, this research explicates some everyday ways in which family finances are coordinated and managed. We provide a number of examples of 'financial systems' from our field study which will illustrate how families in their natural environment creatively devise and cooperatively use such systems. We focus on both the material and social qualities of these systems and show how these systems are integrated into people's everyday lives.
2. *A new perspective on domestic lives.* Attending to family finances, this research will contribute towards an understanding of domestic lives from a financial perspective. This understanding will add to the existing repertoire of research within HCI and CSCW [6, 7, 14, 26, 41, 42, 43, 44]. This work will show that through the use of financial systems, family members not only get a better handle over their finances but also over their domestic routines, values and social relationships.
3. *Designing for financial activities.* We derive several important properties of financial systems that can provide directions for designing tools to support financial activities in domestic settings. Our findings do point to an over reliance on non-digital tools when it comes to organizing household finances, nevertheless our recommendations are sensitive to the social practices of our participants.

RELATED WORK

Dealing with finances within the domestic setting is a relatively new topic for the CSCW research. To provide an adequate literature review and set a platform for our work, we begin by discussing some work from the economics and consumer research literature and then move onto the HCI and CSCW literature on domestic settings. We describe some of the early studies in the area of family finances and show how our work extends this research area.

Family Economics

The issue of how households organize their finances has been extensively studied in the field of economics and consumer research. Some of the earlier studies [33, 11] have focused on the roles of spouses in supporting financial management. Using a sample data from 73 couples, Godwin and Carroll have identified the following factors that affect positive financial management behaviors in spouses: number of years married, completion of a course in consumer education by a spouse, and occupational status of wives. Pahl [27] has developed a classification of households based on their money management patterns: Female Whole Wage (wife manages the wages), Male Whole Wage (husband manages the wages), Housekeeping Allowance (main earner gives fixed allowance for housekeeping to the partner), Pooling (both partners contribute to a common pool of money) and Independent Management (partners independently manage specific items of expenditure). This classification has been influential as an analytical tool and has provided a strong basis for understanding how couples organize their household money and how this may impact their wellbeing. In a collection of studies by Stocks, Diaz and Hallerod [40], a comparative analysis is provided on the attitudes towards sharing finances within couples, their differing approaches to sharing income and expenses, and cultural aspects that are at play when making financial decisions. This study contends that when people are talking about managing their money they are in fact talking about managing their personal and social identities.

Studies in behavioral economics have focused on financial knowledge and practices within household settings. Households with good financial knowledge (gained through social networks or personal experiences) are shown to be better at financial practices such as organization of cash-flow and credit management, handling of savings and investment [16]. Based on their qualitative studies, Muske and Winter [22, 23] devised a framework for family cash-flow management. They showed that families have specific financial processes in place that are informed by aspects related to safety, control, comfort and routines. Gudmunson and Danes [12] have focused on family socialization processes such as family interactions and relationships and argued that family socialization has an important role in producing better financial outcomes. The role of parents is shown to be an important factor in enhancing financial literacy among children and adolescents [4]. With the rapid blurring of gender roles and diversification in family composition and structure, several recent studies have focused on aspects related to independence and trust [1, 28], control [31], identity [39] and gender roles [48] to understand family finance.

Different from these studies, our focus is more human-centric where we aim to develop a better understanding of the situated nature of household financial practices, focusing specifically on the financial systems.

Domestic settings and HCI

In the recent years, HCI has seen a large increase in studies exploring domestic settings and the technologies that may be situated in them. Studies have shown that domestic routines are coordinative in nature and play a central role in in our understanding of domestic lives [7, 29, 41,]. Tolmie et al. [43] discussed how routines become an integral part of what they refer to as the 'glue of domestic life'. By analyzing specific mundane details of everyday life, the authors make a case for the importance of observing the unremarkable aspects of routines, and suggest that integrating awareness of these details into technology design presents a major challenge to HCI's research agenda. A set of studies by Crabtree et al. [5, 7] focused on the coordinative aspects of household routines, where the authors map the physical characteristics of homes as well as capturing how mundane activities could contribute to the social organization of household spaces. The ethnographic studies of Taylor and Swan [41] focused on understanding the artful ways families develop ‘organizing systems’ utilizing the domestic informational artefacts such as calendars, to-do lists and paper notes. Using examples from the field they show that in addition to supporting the organization of daily routines, these systems also shape the social relationships between family members. Perry and Rachovides [29] explored the different ways families create their entertainment through situated messaging in the home. HCI and CSCW studies have also focused on specific aspects such as the use of calendars [5, 24], photos [42], mementos [30] and organizing paperwork such as bills and letters [14] within domestic settings.

Money in HCI

Despite its importance, interacting with money has been subject to little HCI research. In light of the recent ‘credit crunch’, government agencies in the UK have funded a set of projects within the theme of Digital Economy [8]. A qualitative study by Vines et al. [46] of 38 individuals living on a low income in the North East of England elicited several practices related to delaying, prioritizing, planning, watching and hiding monetary transactions. Kaye et al. [18] in their ethnographic research suggests that financial practices are influenced by personal history and upbringing; that people are creative in the ways they budget and save money and that many people do not closely monitor the overall state of their finances. These authors also showed a strong emotional link between people and their finances and how sometimes emotions may take over the economically rational decisions. Other studies have focused on investigating the ‘acceptability’ of modern technologies to support monetary activities. For example, a study by Mainwaring et al. [20] showed that cultural and social aspects are strongly attached to the acceptability of a ‘smart’ payment system using Near Field Communication (NFC). Another qualitative study by Vines et al. [45] on households of people aged over 80 showed that there is a strong trust issue associated with paper cheques that may stay in place even though financial reforms suggest new technologies to replace cheques. Applications and tools such as mint.com, Manilla and Quicken have been found to be poorly aligned with broader cultural, social and societal issues related to money and people’s existing money management practices [37]. Kerber et al. [19] developed a concept of a digital household account book, which allows automatic receipt scanning instead of manually entering them. Consideration of the literature above however suggests the development of such systems runs the risk of bypassing due consideration of people’s existing practices and routines related to their financial management.

Building on this solid starting point of literature in this area (especially [18, 46]) and connecting our work to the economics and consumer research literature, we provide a detailed account of domestic financial systems focusing on the nuanced and situated practices of family members.

THE STUDY

Participants

Following the approval of our institute’s ethics committee, we started our recruitment process in Brisbane, Australia. We advertised on Gumtree (similar to Craigslist) and social media websites and posted flyers in large shopping centers. We aimed at recruiting families within a reasonable proximity to the average Australian household income [2] and participants were screened accordingly.

We recruited 15 families in total. Our recruited families included: 11 married or de facto couples with at least one dependent child; 1 single parent with children living at home; 1 young couple without any children; and two married couple with grown up children who had left home. On average the household income of these participating families was $110K, which brings them into the category of above average income within the Australian standards. In terms of employment, only one family had both the partners retired, with at least one earning member in the remaining families. Table 1 provides detailed description of our participants.

Methods and Setting

Our interviews took place in the participants’ homes. The interview process began with questions related to family demography, income and occupation(s). Adapted from Pahl’s methodology [28], we introduced an exercise called ‘flow of money’ – where we asked our participants to draw a flow chart detailing the avenues through which their money was earned, spent and saved, and the processes through which these things took place- i.e. which expenditures were paid from which accounts. As most of our participants (14 out of 15) were married or had a de-facto partner, this activity allowed us to see the social organization of their finances; for example which accounts/loans were joint/separate and which partner paid for which expenses. This provided us with a comprehensive picture of their financial management and also helped us gain knowledge about specific arrangements they had in terms of their finances. For some it was a simple exercise where they had only a single joint account into which their income was deposited and from which all the expenses were paid out. For others, this turned out to be a complex web of multiple bank accounts, credit cards, loan offset accounts, salary sacrifice and voluntary contributions to savings and superannuation accounts.

Following this exercise, we asked participants questions about their financial philosophy, their use of financial instruments such as spreadsheets, online banking and the different methods and systems they have in place to manage their finances. Our focus was to understand the assemblies, use and experiences related to the financial systems that our participants had in place. As our work was *in-situ*, we were

#	Pseudonym (age) and dependent children (age) (G=Girl, B=Boy)	Total Income	Details affecting family income	Financial systems discussed in the study
1	Nicky+(34), Albert+(32), B(4), B(4)	$125K	Home loan; tax benefits due to their employment in non-profits.	Online banking; receipt/invoice folders; payment reminders on fridge.
2	Jenny+(35), Nathan+(36), B(1)	$140K	Home loan; Investments in stocks.	Online banking; digital spreadsheets; receipt/invoice folders.
3	Joan+(43), B(10), B(9)	$74K	Renting; Child support from former partner.	Online banking; payment reminders.
4	Dani(34), Richard+(36), B(5)	$115K	Renting; Savings in foreign banks.	Online banking; digital spreadsheets.
5	Tina(48), Ben+(49), B(18), B(16), G(11), B(8)	$80K	Housing and related expenses are included in Ben's employment with a church.	Online banking; coin jars; invoices stored in a wall organizer; digital spreadsheets.
6	Jenny+(42), Frank+(43), G(16), G(13)	$120K	Home loan; large savings in the off-set account.	Online banking; diary; payment reminders.
7	Nancy(67), Ron(69)	$42K*	Mortgage paid off; war veteran benefits.	Hand-written spreadsheets; bills collection.
8	Sonia+(32), Jack+(33), G(1)	$100K	Home loan; extra cash from a trading business.	Online banking; coupon collection; diary.
9	Jo (35), Jim+(38), B(12), B(10), B(3)	$85K	Renting.	Online banking; handwritten spreadsheets; cash envelopes.
10	Nina+(58), Mike+(57)	$150K	Home loan; Mike lost his superannuation as his company went under; Nina doesn't have super.	Online banking; digital spreadsheets; cash envelopes; Invoice/bills calendar.
11	Jacky(25), Geoff+(26), G(2), B(1)	$70K	Home loan; lost $40K on the house due to floods.	Online banking; payment reminders; cash envelopes.
12	Kim+(29), Sam+(27)	$160K	Home loan; Investments in stocks.	Online banking; coin jars; invoice folders.
13	Carla+(39), Jason+(49), G(8), G(4)	$70K	Home loan; tax benefits due to non-profit work.	Online banking; invoice folders.
14	Jane+(45), Barry+(57), B(9), B(6)	$200K	Mortgage paid off; income varies drastically due to Barry's business.	Online banking; payment reminders on a physical notice board; folders.
15	Beth+(35), Dan+(45), G(3)	$120K	Renting.	Online banking; folder; payment reminders.

Table 1: Description of participants. + denotes income earner. * denotes pension amount.

able to view these systems, their placements in the home and how they constituted a part of the social fabric of the household lives. The interviews were audio recorded and later transcribed. In our analysis we used the interview transcripts, 'flow of money' diagrams and the images we took in the homes of our participants.

RESULTS

We found that our participants used a varied set of instruments and tools in order to create domestic 'financial systems' that suited their specific needs. Figure 1 shows a few examples from our study. As one can see, these examples varied from the use of simple coin jars by family 12 for buying fruits from a local market (figure 1a), to archiving important bills and receipts in a physical folder by family 2 (figure 1b), to attaching bills on a fridge surface for due date reminders by family 11 (figure 1c), to the use of re-usable digital spreadsheets for comparing product options and making important financial decisions by family 4 (figure 1d). Although the use of online banking sites was quite prevalent in our participants, the use of physical instruments such as paper diaries, folders of invoices and bills, handwritten spreadsheets were quite dominant. Interestingly, none of the 15 families were using any financial applications at the time of our study.

We carried out thematic analysis [13] on the participants' data, where we inductively identified patterns and themes within the data. From our analysis, we developed three themes of domestic financial systems: Macro-level arrangements, Locale-based systems, and Goal-oriented systems. *Macro-level arrangements* are global representations of a family's finances, where a complete lifecycle of money-flow is represented: starting from when it is earned to when it is spent. *Locale-based systems* utilize physical and spatial resources of homes to support activities related to everyday finances. *Goal-oriented systems* are purposefully designed for achieving short or long term family-specific goals, e.g. saving money for a holiday trip or buying a house. These themes are derived from the data that we collected and are not mutually exclusive. In several cases we found that financial systems belonged to more than one theme. Based on these themes, we discuss some examples of the financial systems devised and used by our participants.

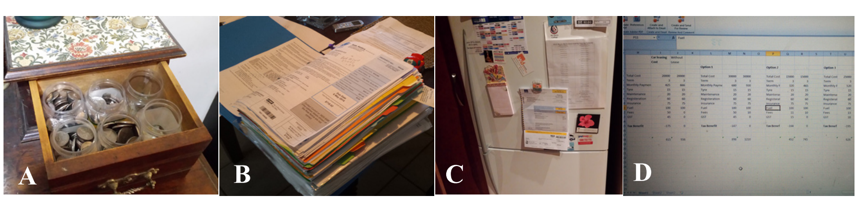

Figure 1. Examples of household financial systems.

Macro-level arrangements

Our 'flow of money' exercise provided some useful information about the macro-level organization of our participants' household financial management. The flow charts developed through this exercise incorporated a wide range of financial activities and showcased how these were connected to their everyday lives. We will discuss two examples of such arrangements in this section.

Nicky and Albert (family 1) are married and live in their new home with 4 year old twin boys. Nicky as the principal organizer of their finances drew a flow chart (figure 2) and described how the couple is currently managing their family income. They both work for non-profit organizations and manage their collective incomes through seven different accounts. Essentially, their current situation is heavily influenced by their recent purchase of a house. Their home loan is divided into two accounts, one has a variable interest rate (1) and another has a fixed interest rate (3). They have a joint account (2) where they pool together a major part of their salaries. These three accounts (1-3) are in one bank and they connected to their home loan. The joint account (2) is connected to a credit card account (5) that they share and two high interest personal accounts, one for Albert (6) and one for Nicky (7). Because she works in a non-profit organization, Nicky is able to utilize a salary sacrifice scheme where she can bring in 30% of her income to a salary sacrifice account (4). Albert also uses his salary sacrifice opportunity to pay for the home loan. The family pays for all their main expenses from their joint account (2) and Nicky's salary sacrifice account (4). Some specific expenses such as telephone, internet and the daycare charges are paid through direct debits from the credit card account.

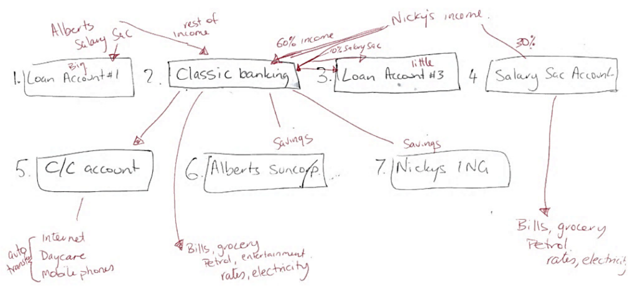

Figure 2. Financial organization of Nicky and Albert. (The 7 boxes represent different accounts)

Connecting to this to behavioral economics of Hilgert and Hogarth [16], this arrangement is a good example of good financial literacy put into practice, where both Nicky and Albert have been active towards paying off their home loan and at the same time maximizing their savings. Both of them have utilized their salary sacrifice opportunities to the maximum. All of Albert's salary sacrifice goes into the bank loan whereas Nicky uses her salary sacrifice for handling household activities and paying bills. According to Nicky, they are very careful about their spending and would rather keep their money in high interest savings accounts (6 and 7) rather than in the everyday joint account. When we asked why this was the case, she commented:

"All our money goes in together. He has an automatic transfer coming out of the joint account every fortnight into his Suncorp account. It's just to keep things separate. If the money is just sitting in there, then you feel like 'spend it'. Whereas if you separate the money from the beginning then you kind of put the money somewhere you cannot easily touch. I don't know how he does with his Suncorp account, but mine is with ING. It used to be hard to access that account, so you wouldn't do impulse purchases with that money."

Another interesting aspect of this family's macro-level financial organization was the combination of trust and independence. Even when they both were contributing toward the joint account to pay off their home loan, they used the remaining balance of this account to support their personal needs and goals. Albert uses his personal account towards saving enough to buy land in Africa (in his native Ghana), where he and Nicky eventually plan to build a house. Similarly, Nicky uses her personal account for saving money that she earns from occasional foster care assessment service that she performs. She aims to save for an overseas holidays with the family. In a way, this system shows both Nicky and Albert's short and long term aspirations and their mutual respect of their individual aspirations. When we asked about how they came up with this system, Nicky answered, *"it just kinda happened!"* As the family's situation and needs change their financial systems are also adapted to suit those.

In the second example, we show a more simplistic macro-level arrangement (figure 3). Dan and Beth (family 15) work full time and have a 3 year old daughter. They both pool in their salaries into one joint account, which is then used to pay of the rent, groceries, childcare, fuel and credit card bills. Beth has kept a savings account where she pools in at least a certain amount per month. During the interview session, she gave the following account:

"The goal is to not be too complicated, especially for my partner. He has been a spender in the past and this way I want to have a proper control over our savings."

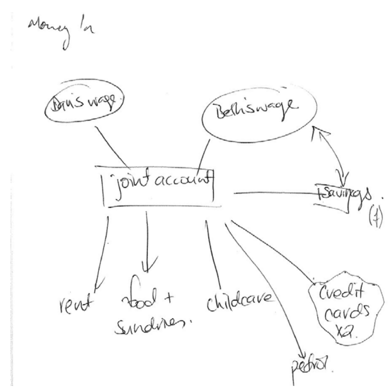

Figure 3. Financial organization of Beth and Dan.

From our interview, we found out that Beth and Dan has had some relationship problems due to Dan's careless attitude. Beth has been instrumental in making sure that she takes the lead on their finances. Each month Beth would transfer $500 to her savings account so make sure that there is a "buffer" in case either of them needed some money. The family's larger aim is to save enough money to apply for a home loan. On Dan's attitude, she commented:

"We used to have two credit cards, one used to belong to him and then I took it over when I realized that he was putting things on there and forgetting about them. Just forgetting. Money is not something he's had at the forefront of his mind till the last few years. He's always had a good job and never had to worry about making sure that there's enough to cover bills. The last couple of years the company he was working for went under and so it's been

a bit difficult for him since. And yeah money is definitely the biggest issue in our relationship… full stop."

Beth and Dan's financial arrangement shows how relationships are maintained and negotiated through such a system.

Locale-based Systems

This theme highlights the placement and the situated nature of some of the financial systems that were studied in our fieldwork. Specific locations in homes such as study rooms, kitchen desks and other common areas were used by families as placeholders for their financial instruments such as invoices, handwritten spreadsheets, and so on in order to support coordination between family members. In some cases, bills were strategically placed on kitchen desks and fridge surfaces (figure 1c) as reminders. In the following, we will discuss two such examples from our study.

The wall organizer

Tina and Ben (family 5) are in their late-forties and have four children of age 18, 16, 11 and 8. Ben is a minister at a church and lives in a house provided by the church; and Tina is a home maker. The family has a wall organizer (figure 4) in their family room (close to a computer desk), where they keep all the documents related to their everyday finances.

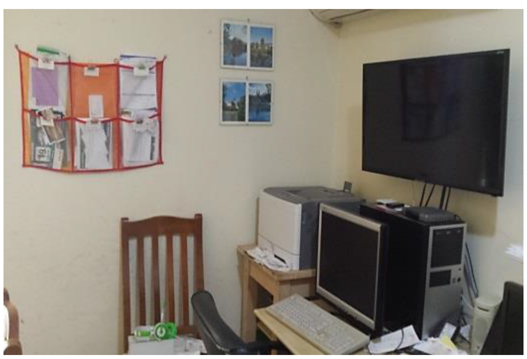

Figure 4. The 'orange' wall organizer.

The wall organizer is a transparent document organizer with six sections. Tina labeled these sections as 1) high-school, 2) primary school, 3) health, 4) receipts, 5) household and 6) church. Tina described her rational for devising it:

"It was something that I thought could be useful. I divided our lives into six categories - the different things that should be done - mostly financial. So, I divided them into the receipts that need to be filed, things that needs to be dealt with like the invoices and information from high school and primary school. This is especially, because I pay them from different accounts than a lot of other things."

Tina occasionally did paid jobs and even rented out the extra room of her house to international students whenever she could. She had a separate account where she would keep money earned from such activities. She was very conscious that she used that account for funding her children's extra-curricular activities such as camps or trips. As the couple had 4 kids all going to schools, Tina intentionally kept two sections of the organizer for the two schools her children go to. She said: *"This just minimizes the information that I should look through. 'Cos once it's out of sight, it's out of mind."*

The use of the wall organizer was a collaborative effort among the family. Tina would take the responsibility of placing and sorting all the important documents and invoices in the right section and would make a list of all the things to be paid in a word file on the computer. During the evening time, Ben would look at the word file and would make payments if required. He would also update the word file so that Tina could also keep track of their finances. The situated-ness of the wall organizer in a close proximity of the computer and printer allowed the couple to coordinate their finances efficiently. As Ben commented, *"once they are paid, they go into the filing cabinet. These are just the things under my eyes to remind me"*.

Depending on their needs and everyday activities, Tina would actively change the labels of some sections if they were not frequently used. The section with the label "church" was related to Ben's work. As he was the minister of the church, he would compile all the relevant documents and invoices related to the church, which he would either deal with himself or pass onto others. The couple would also need to keep receipts of any expenses in the house since the house was provided by the church, they would claim some expenses related to this house.

"The most active things there are the high school and primary school ones. Things will generally get paid relatively quickly from those two, because there isn't a lot of time between the invoices when come from schools and when they are due. … There are things in there that will stay for a day or two, and some things might be in there for a number of months. Things related to camps for example."

The financial hub

Nancy and Ron (family 7) are in their late sixties and are retired. Ron is a war veteran and receives a higher level of pension and additional health support from the government. The couple has completely paid off their home loan and their financial management is mainly related to their pension money and interest earned from term deposits.

Nancy and Ron have developed a financial hub that combines a set of smaller financial instruments on corner of their kitchen bench (figure 5). The hub combines a notice board full of financial artefacts such as handwritten spreadsheets, invoices, and other financial documents; with other artefacts (medicine box, radio, telephone, etc.) placed on the horizontal surface (figure 5a). Ron is dedicated towards organizing their finances and has setup a particular process. Whenever a new bill arrives, it is entered into his account book (figure 5b) with dates by which they need to be paid and bills are stored in a zip-lock bag. He hangs his book and zip-lock bag on the notice board so that he can easily access them. He would highlight the entries once he has paid those bills. Referring to his financial hub, Ron said:

"I keep everything in one spot and I know what's going on. I've got a fan being installed in my bedroom so I have to ring up one of the electricians to install it...It's sort of the running of the household!"

Figure 5. The financial hub (a), a hand-written spreadsheet (b) and a 'glancable' yearly financial sheet (c).

Figure 5c shows a calendar page which he calls the 'yearly financial sheet'. Ron had utilized this page to keep track of his year-long expenses. On this sheet, he had written down his most common monthly budgeted expenses such as grocery shopping, phone bill, petrol expenses and so on. He uses the same process of highlighting once an expense is paid off. He has also written down the birthdays of his family members (children and grand-children) so that he is able to budget for the gifts that he would buy for them. Ron has kept the 'yearly financial sheet' visible on his notice board. To Ron, this document gives him and Nancy an overview of what's coming. They used this to get a 'glance' over his overall finances, whereas the example shown in figure 5b is a much more detailed month-by-month account of his expenses and that is not made visible for the purposes.

Both of these examples show that in addition to supporting financial activities, these financial systems incorporated and supported family routines and to an extent family relationship. Some of the well-known CSCW principles such as 'public availability' [15, 32] and 'coordinative displays' [7] were quite visible in the organization of these systems.

Goal-oriented Systems

This theme highlights financial systems that were purposefully built to achieve specific needs and goals. We observed a wide range of goal-oriented systems in our field data. This ranged from the use of coin jars to the use of cash envelopes with fixed spending amounts to the use of digital spreadsheet.

In this section, we will use two examples of goal-oriented systems from family 10. Nina and Mike are in their late fifties. Mike works as a professional management training provider and Nina has a casual job where she works 4 hours a week. Mike had lost all of his superannuation savings in a company that became insolvent a few years earlier. Even though the family was financially stable at present (Mike earns $150K a year), Nina was concerned about their financial future in their retirement years. As she said, *"We are saving money but not enough to fund our retirement and that worries me more so than it does to Mike. That's why I am personally struggling."* Nina has been looking for a full-time and stable employment since Mike had lost his superannuation. But so far she was unsuccessful. The following two examples of financial systems will showcase the family's efforts toward coordinating and managing specific financial goals.

The cash envelopes

Nina and Mike have developed a system where they used a set of cash envelopes with pre-defined amount of money they are supposed to spend on activities such as haircut, petrol, coffee, groceries and so on (figure 6). These envelopes were kept in a tray and that tray was placed on a book shelf in the family room.

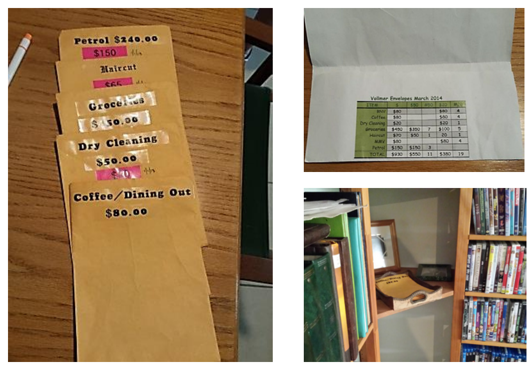

Figure 6. The cash envelopes, a spreadsheet and its placement.

The cash envelops system was aimed at controlling the family's spending, especially the sundry and small household expenses. Nina and Mike have been using this system for some years now and Nina indicated it controlled their overspending habits. They have a specific procedure for forming this system every month. Nina provided the following account on how they developed this system:

"We're kind of bizarre in that once a month we go out and have a coffee and we discuss our finances. We use that monthly financial meeting to make sure that we're on track and if there's an expense coming up then we budget for it. "

"We came to this [the envelopes] *from two different ways. Mike does his spreadsheet the computer and walks me through the numbers. I can see how they are progressing. I can see the difference between projected and actual. But his logic for the spreadsheets I don't get. I agree with the outcome, though. I use his spreadsheets and once a month I go and take out cash from an ATM to put in the envelopes."*

The system of using cash envelops along with the spreadsheet is a joint effort by both Nina and Mike. As Mike is the one who looks after the online finances, he has a better grasp on the overall picture of their finances. He regularly creates spreadsheets of their sundry and miscellaneous expenses. Once they decide on their budget, Nina ensures that she obtains the right denominations of bills in the envelopes such that the money in the envelopes corresponds to the correct money allocated on the spreadsheet. She follows quite a meticulous process for this system.

The couple would regularly review the amount they put into the individual envelopes or if there was a need to create or discard any of them. Nina said, *"if we've got a big expense coming up then it's the envelopes that are usually the first to get hit."* This suggested that their use of this system was quite scalable. Nina went onto say:

"The dry cleaning is like $20 per month but then we don't dry clean every month. Sometimes the dry cleaning money is used for petrol if we're burning more petrol one week. The groceries envelop never comes under. Usually if it's the last week of the month and we've got anything extra we just have a nicer than usual meal. Sometimes we'll use the petrol money on a project around the house. We're not very exciting people."

"There's an example. So it [referring to the envelope titled Petrol] used to be $240. But then the car that we bought is a hybrid and the fuel costs have reduced, so we went from $240 to $150 per month."

The cash envelopes are devised specifically to cut down the miscellaneous expenses, which are typically smaller in amount but harder to control; and allow Nina and Mike to increase their saving capacity to fund their retirement.

The calendar

Nina and Mike used a pocket-based calendar (figure 7) to store their invoices and receipts. The calendar has two pockets on each side, where all the important bills and invoices are stored.

Figure 7. The calendar with pockets.

Both Nina and Mike would use the front pocket of the calendar to store bills and invoices and the back pocket to store payment receipts. The goal of devising such a system was to ease the process of filing for tax returns. As Nina said:

"I keep receipts for everything then once a quarter we go through and put them into sheets for tax purposes and then in October we go through all the quarters and do our tax submission."

Nina mentioned that at the time of tax filing, they both would coordinate:

"Well we divide it up. I do a lot of the manual part of it I sort the dockets into the spreadsheet. Then Mike double checks and sees what needs to be recorded elsewhere. Coz some of them are Halloween decorations that I find in a bargain shop. There is no reason to keep the receipts for them; I use my pocket money for that because it entertains me."

Although this system was mainly about storing invoices and receipts, its integration into a calendar was the main reason why it worked. Nina was able to store all the important documents on a month to month basis which is useful for her to get back to them easily whenever needed, especially when filing taxes. Nina also carefully made sure that invoices that needed to be paid are in the front pocket so that she gets reminded about it. The receipts were kept on the back pocket, so that if she needed to return an item then she knew where its receipt was.

DISCUSSION & IMPLICATIONS

While we would refrain from suggesting that these examples of financial systems provide the complete picture of the household financial management, we do believe that they shed light on the artful and creative ways people incorporate their social lives into financial activities. Building on some scoping studies [18, 46] in this area, this paper has extended research towards exploration of issues around the management of "family finances". Using a bottom-up approach, we have examined the systems families use and their situated practices surrounding these systems.

Domesticity and Finance: Values, Relationships & Routines

One of the major realizations that we have had through this work is that all these examples of the so called 'financial systems' incorporate familial values, relationships and routines. Money and financial issues are so intertwined with different aspects of family lives that these financial systems often convey as much about our everyday routines, social relationships, values and aspiration, as they do about tracking and management of money. We contend that practices surrounding these financial systems are socially formed and become habituated in the domestic settings.

On the one hand, it was clear that there were strong practical reasons and motivations behind the design of these systems. For example, maximizing tax benefit and utilizing the salary sacrifice option to increase the saving capacity was a clear strategy in Nicky and Albert's finances as depicted in figure 2. This resonates well with the findings of Hilgert and Hogarth [16] from the traditional economics literature. Nicky and Albert's financial literacy and practice allowed the family to achieve better financial outcomes. Self-control and budgeting for only the essential things was another practical motivation that Nina and Mike had. Inherent to some of these financial systems was the goal-driven nature. Nina and Mike's cash envelopes were specifically focused on controlling their miscellaneous or sundry expenses. In Muske and Winter's work [22] from the behavioral economics perspective, the issues related to safety, comfort and control are seen to be major factors in household financial practices. Nina and Mike's cash envelopes are a good example of a system that encapsulates these aspects. It was clear that major household expenses such as rent, mortgage and loan repayments were much easier to track, compared to smaller expenses. Nina and Mike's system had specific goal of managing and controlling these smaller cash purchases. Other practical motivations behind these systems were getting reminders utilizing specific locale in the house (by keeping the system in the visible locations of the house) and bookkeeping (by keeping detailed entries of expenses in books). Above examples encapsulated more pragmatic values that were directly connected to the financial wellbeing of these families.

On the aspect of maintaining and appropriating family relationships, the macro-level banking arrangement of Beth and Dan was a very good example. Beth clarified that finance played an important role in their marriage and their relationship was reinforced through such a financial structure. Similarly, Nina's frustration of not being able to get a job and help Mike fund their retirement years was quite visible in the two financial systems that we discussed in figure 6 and 7. To Nina, if she could not contribute directly, she reinforced her participation in the relationship through saving money. Similar to this, Tina (family 5) took care of her 4 children's school activities through the wall organizer.

It also became visible that these financial systems were also taking care of the social needs and routines in the home. The orange organizer (figure 4) was a very good example of how it combined many everyday routines related to children's school activities, Ben's church matters and other household matters. Similar to this, Ron's financial hub was summarized as "running the household". Ron also kept a list of birthdays of his children and grand-children to make sure that he budgets for gifts that he may have to buy on a certain date. The example of Nicky and Albert's system showed that they both cared about each other's aspirations and likings. Even when they had a big home loan to pay off, Nicky was quite supportive of Albert's decision to buy land in his native country. Crabtree [7] and Taylor's [41] work showed how families coordinate their routine activities through the use of calendars, notice boards and other spatial resources. Our findings suggest that financial management is also organized with and through similar household objects such as the calendar, organizer and noticeboards.

On the topic of financial role and responsibility, our findings were closely related to the traditional economics literature [1, 11, 33, 48]. For example, families where both the partners were earning, the partners kept independent accounts and credit cards, while still maintaining joint accounts and home loans. The aspects of control and trust between family members were quite apparent in our findings. We have provided a detailed account on the role of trust and control elsewhere [38], hence we have not delved on these issues in this paper.

Properties of Domestic 'Financial Systems'

Perhaps a straightforward conclusion that can be drawn from this research is that families incorporate certain values and strategies to in the way they created and used these financial systems. These values and strategies differed from family to family but there were certain common properties that we would like to highlight here. An understanding of these properties can be very useful when designing tools to support financial management within homes. These properties are: Setup, Form and Scalability.

Setup: The setup and placement were integral to the design of these financial systems. Family rooms, kitchen areas and study rooms were frequently used as placements for these systems. For Nancy and Ron, most of the organization of the household finance occurred at one end of their kitchen bench. This was where Ron kept the records of their financial activities in this area, along with other household items such as telephone, radio, medicines and so on. Ron placed the highlighted yearly financial sheet on the notice board so that he and Nancy both get reminded of their upcoming expenses. The wall organizer in Tina and Ben's home was placed in the family room next to the computer desk. This was done to support the ease of access and coordinate the payments of bills on time. Such setups utilized the idea of 'public availability' [32] – a well-known perspective on coordination within the CSCW field. The example of the pocketed calendar system (figure 7) also had this feature where it allowed Nina and Mike to coordinate and sort their bills and receipts of payments.

The design of tools for supporting financial activities needs to take into account the importance of spatial resources that homes have. While much design is focused on the digital space for finances, for example the internet banking websites, mobile budgeting apps etc., less is dedicated to the physical spaces, such as the various financial hubs employed by many of our participants in managing their money. For this reason we consider the spatiality of family finances to be a promising area for future research.

Form: In addition to the setup, the form of these systems was also an important property. In our investigation, we observed a predominantly high use of physical systems. Use of digital tools was limited to internet banking and Excel spreadsheets for budgeting. Interestingly, we saw the use of hybrid tools that utilized a mix of both physical and digital tools. The example of cash envelopes may seem to be purely physical system, but it has been created using computer-generated spreadsheets by Mike. Similarly, the combination of the orange wall organizer and the computer next to it created a hybrid ecology which allowed Tina and Ben to coordinate their finances.

CSCW literature has emphasized the role of physicality and materiality in supporting extended cognition and coordination during joint activities [25, 32, 35, 36]. Materiality and physicality were quite integral in the design and use of these financial systems. The semitransparent wall organizer not only allowed storage of different financial documents, it also afforded family members see if there are any pending documents that needed to be dealt with. On the other hand the physicality of the cash envelopes allowed Nina and Mike to keep those envelopes away from their attention and the labeling allowed them to keep track of their spending on specific miscellaneous expenses on "coffee", "dry cleaning" and so on.

The form of financial systems and their physical placement in the home aided to their presence, visibility and accessibility in the home. The calendar system as well as the wall organizer were positioned in highly trafficked areas of the family home. While Excel spreadsheets and other computer based financial artefacts may work well for families where one person is primarily responsible for handling all the finances, a key feature we observed of the material artefacts was their being accessed by family members to collaborate and cooperate around family finances and other family activities.

Scalability: Families are dynamic entities and change as life stages progress and financial situations fluctuate. We found that the systems people used to manage their money were scaled to their specific situations. Nina and Mike for example scaled the amounts in their cash envelopes depending on the forecast availability of income as determined by their monthly financial meeting. Nicky and Albert's banking arrangement also showed scalability when they purchased a home. The orange wall organizer had 6 pockets, but Tina indicated that she often created new labels and added new category of financial activity in it.

Thus it can be seen that family finances are changeable and as such, the systems our participants used to manage their finances were scalable. This is an important consideration in design, where any systems deployed to assist families manage their finances must be able to be appropriated by the family and scaled to their specific circumstances. A key concept in HCI and participatory design is to design for appropriation; rather than designing completely finished products, emphasis is placed on designing adaptable artefacts that can be appropriated to a given situation. This is particularly important in the context of family finances, where the diversity in the practices, systems, trust and routines of financial management mean that a one-size-fits-all approach to design is unlikely to work in this context.

Design Insights

As we showed in the paper, while our participants did make use of the internet banking sites, it was the physical systems that dominated their household management and organization of finances. In the following, we extract certain features of the domestic financial systems to show what really works for participants when they use physical systems.

Technology Non-use

While it is a common practice within the HCI/CSCW research to develop a set of technological ideas derived from a field understanding; findings such as ours and of many others [3, 34] do suggest that technological solutions may not be the best answer in such situations. In some cases, it can even be counterproductive [36]. As we showed in our findings, the use of physical and non-technological financial systems was dominant over the digital financial tools. The three properties of financial systems that we identified in the previous section, namely, setup, form and scalability suggest that when it comes to domestic lives, families tend to appropriate their systems depending on their specific situation and needs. Online banking was in fact quite heavily used, but such tools do not allow any type of appropriation. We suggest that there is a need to critically question the role of digital solutions in cases where the use of non-digital technology is habituated.

While we advocate the 'non-use' philosophy [3], our findings do hint at possible ways a better relationship between family finances and design can be developed.

Dealing with sundry expenses

Our participants pointed out that it was easier for them to keep track of their larger expenses such as home loans, and rents, whereas managing smaller, miscellaneous expenses was challenging. The examples shown in figures 3 and 6 had a strong focus on managing the sundry expenses. The cash envelopes were explicitly designed to control such expenses. Designers need to take this point into account and enable users to pay specific attention to their spending habits on sundries.

Setting short and long-term goals

Setting financial goals and working towards them was seen in the examples shown in figures 1a, 1d, 6 and 7. The cash envelope system was aimed at controlling sundry expenses, so that Nina and Mike could save enough money for their retirement. The calendar system was aimed at storing all the relevant bills and payment receipts for tax return purposes. In the example of figure 3, Beth indicated that she had a savings account where she would transfer at least $500 a month to be able to buy a house in future. Design of financial tools needs to allow users to create short and long term financial goals.

"Out of sight, out of mind"

We previously discussed the aspect of public availability [15, 32] that was inherent in several of the financial systems that we discussed in this paper. Keeping different financial objects visible and easily accessible reminded participants of their due dates and allowed other members of the family to coordinate and adapt their activities accordingly. Ron's highlighted yearly financial sheet had glancable features that reminded him of his upcoming expenses. Similarly, the wall organizer, calendar and cash envelopes also incorporated the aspect of public availability.

This design insight shows that technology may not be easily adapted to suit such behaviors and practices. As a design feature the aspects of visibility and public availability are of great importance, and CSCW literature [15, 32, 35] has frequently shown their usefulness in supporting awareness and coordination within a group of people

Supporting cooperative use

From a technology design point of view, finance has been treated as a personal and individual phenomenon. For example the majority of mobile apps available in the market assume that only one person is responsible for managing money. Such apps do not account for family dynamics and cooperation, collaboration and division of labor we observed from our households in their management of money. The way Nina and Mike handled their system, where Nina would create cash envelopes from the spreadsheets prepared by Mike showed not only the joint effort but also a joint determination to cut down on their extra expenses. In the case of Tina and Ben, Tina would collect all the important invoices and documents and sorts them out in the orange organizer and later Ben would pay them off on the computer whenever necessary. In a majority of the families we interviewed, we found family finances to be a collaborative, negotiated and democratic process. However, designers need to remember that any design artefact aimed at helping families manage their finances may be deployed into settings where trust is not present, or where one family member has less control over finances. As such, we do not advocate designs that assume a consistent level of trust between family members. Design needs to ensure transparency in financial activity, but at the same time allow for the privacy of all family members to be respected.

CONCLUSION

This paper builds on the existing economics, social science and HCI research into the different ways and systems employed by families in their money management. Using an ethnographically informed approach, we looked in some detail into the different 'systems' employed by families and how these play out in everyday life. We found that managing money is closely connected to other aspects of domestic life and there is a need to look more holistically into the everydayness of managing money. The main implications of the research are that designs in this area must be sensitive to the existing collaborative practices of family members; the tensions between physical and digital 'places' of financial management and that any designs deployed need to be able to be scaled to the particular circumstances of each family.

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