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Mr. Alan Grincell / Postgraduate Researcher, DesignCORE, Institute of Technology Carlow
 Mr. Hilary Dempsey - Lead Supervisor, DesignCORE, Institute of Technology Carlow
 Dr. PJ White - Second Supervisor, DesignCORE, Institute of Technology Carlow

Older Adults and Self-Service Banking:

A user centred study into the behaviour of older adults interacting with automated teller machines, collected and synthesised using visual research methods

It is now well documented that the world's population is ageing and living longer. Thus, there is a growing emphasis on social inclusion and integration for this ageing demographic. Financial institutions implement self-service technologies to reduce costs and add customer convenience. However, there are many customer segments that do not wish to move over to self-service technology and still prefer the traditional branch interaction of using a teller.

References

- Alves, B.L., 2008. A Study on the Clarity of Teaching Tools Used in Older Adults' Computer Training, University of Kansas - Design.
- Banking and Payments Federation Ireland, 2005. ATM Skimming Poster Campaign. Press Release - SafeCard.ie. Available at: <http://www.safecard.ie/media/atm-skimming-poster-campaign/> [Accessed February 16, 2015].
- Berry, K., 2016. The humble ATM - So much more than a cash machine. *Atm Marketplace - Articles*. Available at: <http://news.alaric.com/industry-news/payments/evolution-of-atms/> [Accessed February 22, 2016].
- Booth, P., 2014. *An Introduction to Human-Computer Interaction (Psychology Revivals)*, Taylor & Francis.
- Buxton, W., 2007. *Sketching User Experiences: Getting the Design Right and the Right Design*, Elsevier/Morgan Kaufmann.
- Carpenter, B.D. & Buday, S., 2007. Computer Use Among Older Adults in a Naturally Occurring Retirement Community. *Comput. Hum. Behav.*, 23(6), pp.3012–3024. Available at: <http://dx.doi.org/10.1016/j.chb.2006.08.015>.
- Cleaver, N., 2003. *Skimming & Its Side Effects*. SANS Institute - Information Security, p.19.
- Continuum, 2016. *BBVA Creating the Branch of the Future*. Available at: <https://www.continuuminnovation.com/en/what-we-do/case-studies/bank-of-the-future> [Accessed March 22, 2016].
- Cooper, A. et al., 2014. *About Face: The Essentials of Interaction Design*, Wiley.
- Cooper, A. et al., 2014. *About Face: The Essentials of Interaction Design*, Wiley.
- Crouch, C. & Pearce, J., 2012. *Doing Research in Design*, Berg London.
- DiVanna, J., 2016. *The Future of Retail Banking*, Palgrave Macmillan UK.
- Dowling, G., 2004. *The Art and Science of Marketing: Marketing for Marketing Managers*, Oxford University Press.
- Dubberly, H., Pangaro, P. & Haque, U., 2009. ON MODELING What is interaction?: are there different types? *Interactions*, 16(1), pp.69–75.

Introduction

The full scope of the research project explored and identified the need for Financial Institutions to acknowledge the personal requirements of 'Older Adults' as customers, to address usability and security issues which arise due to the design and implementation of self-service technology such as ATM's. There has been much research conducted in the area of ATM usability and security which quantifies that problems exist (Hayes 2014; European Payments Council 2010; Cleaver 2003; Heuker 2013; Gunn 2015; Banking and Payments Federation Ireland 2005). However, a user behavioural analysis focusing on 'Older Adults' has yet to be conducted and has been identified as a gap in knowledge.

The following article narrates the research approach and methods developed to graphically engage with the user behaviour data collected from an observational study. This visual research method is a qualitative research methodology which relies on the use of artistic mediums to produce and represent knowledge (Jupp 2006). The data resulting from the observation study, once synthesised, informed the creation

of 'personas' which were used to inform a concluding design intervention within the banking community, which framed recommendations for usability and design improvements. The design intervention aimed to support 'Older Adults' emotionally and psychologically, while interacting with the self-service ATM channel and facilitating their independence through security and usability knowledge development.

Design Methodology

The original scoping of research and problem identification was carried out in the form of a literature review. This involved an in-depth investigation into existing literature and material relating to the subject area. This analysis and synthesis of data was iterative by nature, offering the researcher the opportunity to identify potential areas for further exploration. It was necessary of course to engage with industry to develop a practice-based understanding. Engaging with industry in early field research allowed the collection of primary information to be evaluated alongside existing knowledge.

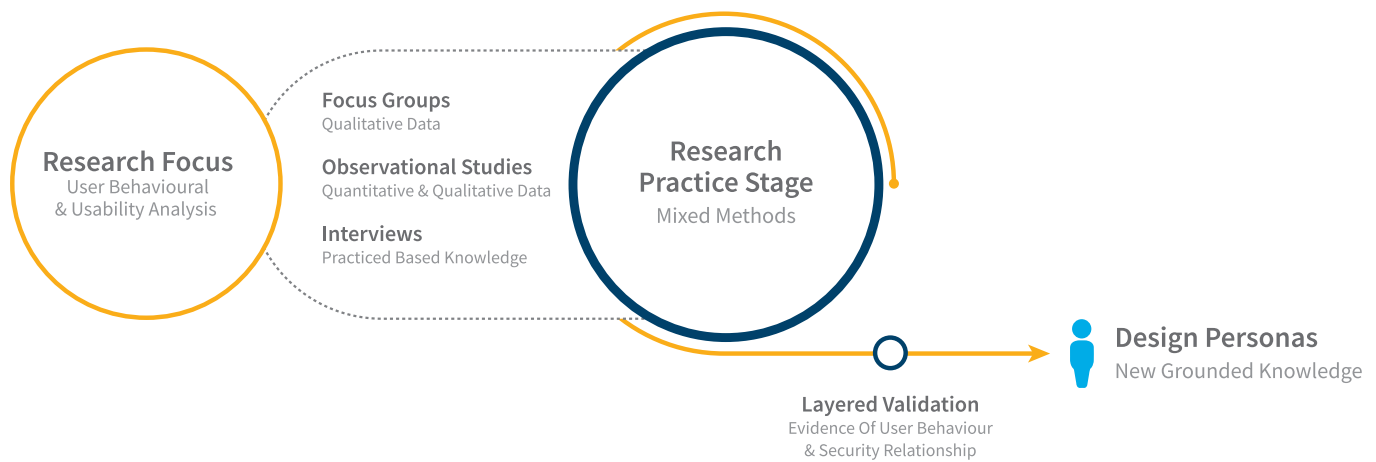


Figure 1: Research Practice Structure & Approach

The user behaviour data collected from the observational study was collected on a broad users group as the research was not at this point focused on 'Older Adults' specifically in the beginning, although the possibility of 'Older Adults' becoming the focus was considered in its method and approach. The observational study, which is further explained later in this article, allowed the research activity to capture user behaviours while also allowing for modelling of different behaviour patterns (Lockton & Harrison 2012). The main body of field research was focused on developing knowledge relating to user behaviour and usability. A focus statement was generated to inform the research activity: *'An investigation into usability and behaviour of 'Older Adults' at ATMs.'*

The investigation was carried out by engaging with 'Older Adults' through focus groups facilitating the collection of qualitative data as it allowed the research activity to gain insight into people's ideas, opinions and attitudes in the form of a conversation between a researcher and a participant (Muratovski 2015). This led to an understanding of user motivations, defined as the holistic grouping of the wants, needs, goals, frustrations, pleasures and fears of users being collected (Cooper et al. 2014). A mixed methods approach allowed for quantitative and qualitative data to be gathered from this behaviour analysis and qualitative data from the focus groups held to be formulated into design personas which guided the design practice stage.

Research Objectives

The principal objectives of the work were to define the behaviours and opinions of 'Older Adults' who interact with ATMs as well as to explore how the financial industry is

developing towards more standalone self-service teller technologies which are cutting back on human interaction in-branch, which will be discussed in the literature review in this article. Banking channels, by the nature of their standalone design, are particularly vulnerable to criminal activity (Slevin 2014; Mushing & Lourenço 2013); furthermore, customers can be left unsupported and misinformed leading to them becoming victims of fraud and crime. The extent of this activity was critically examined with respect to its effects on customers and industry, as well as the varied techniques and methods used by criminals. It was identified that 'Older Adults' and other vulnerable users are increasingly becoming the targets of criminal activity (IPSO 2014 & Hayes 2014).

The research approach utilised current industry knowledge by interviewing experts in their field regarding 'Older Adults' as ATM users by engaging with An Garda Bureau of Fraud Investigation, Age Action Ireland and Allied Irish Banks ATM Business Management / Fraud Division. These interviews provided justification for the research direction of focusing on 'Older Adults', as the original scope of the project was based on criminal activity with no focus on any particular demographic groupings. 'Older Adults' were involved in early research stages in the form of user groups, allowing an awareness to be developed relating to their emotions with self-service technologies as well as developing an understanding of their needs and concerns. An observational study of 87 people interacting with ATMs was carried out, which framed 124 insights into user behavioural habits. Personas were created, which were a combination of the data collected, both qualitative and quantitative, from user groups and an observational study

References

- European Payments Council, 2010. Recommended ATM anti-skimming solutions within SEPA. , o8(December 2008), pp.1-3.
- Flower, G., Fawcett, P. & Harle, S., 2012. Banking: In Search of Relevance : a New Model for a New Reality, Matador.
- Gardner, J.A., 2011. Innovation and the Future Proof Bank: A Practical Guide to Doing Different Business-as-Usual, Wiley.
- Gunn, L., 2015. Summary of Website Research Poll Results. European ATM Security Team - Update, 2.7, pp.1-3. Available at: <https://www.european-atm-security.eu/files/EAST-Research-Poll-Results-Summary-Dec-14.pdf>.
- Hayes, D., 2014. Skimming The Surface – How Skimmer Fraud has become a Global Epidemic, p.46. Available at: <http://www.accaglobal.com/content/dam/acca/global/PDF-technical/other-PDFs/skimming-surface.pdf> [Accessed January 21, 2015].
- Heuker, C., 2013. Smart, informed response required to combat skimming. TMD SECURITY PERSPECTIVE, (May), p.2013. Available at: https://tmdsecurity.com/UserFiles/File/TMD_RBR_Bulletino52013.PDF.
- IPSO, 2014. Crime Alert - Distraction Fraud. Irish Payment Services Organisation Limited (IPSO). Available at: <http://www.ipso.ie/section/lertCriminalsUsingDistractionFraudATMsAreNowTargetingElderlyandVulnerableCustomers> [Accessed February 17, 2015].
- Jupp, V., 2006. The SAGE Dictionary of Social Research Methods, SAGE Publications.
- King, B., 2010. Bank 2.0: How customer behaviour and technology will change the future of financial services, Marshall Cavendish.
- Lockton, D. & Harrison, D., 2012. Models of the user : designers' perspectives on influencing sustainable behaviour, X, pp.1-21. Available at: <http://dx.doi.org/10.1504/JDR.2012.046137>.
- Lockton, D., 2013. Design with intent: a design pattern toolkit for environmental and social behaviour change. Brunel University School of Engineering and Design PhD Theses.
- Margolis, E. & Pauwels, L., 2011. The SAGE Handbook of Visual Research Methods, SAGE Publications.
- Martin, B. & Hanington, B., 2012. Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions, Rockport Publishers.
- Morrow-Howell, N. & Sherraden, M., 2015. Financial Capability and Asset Holding in Later Life: A Life Course Perspective, Oxford University Press.
- Muratovski, G., 2015. Research for Designers: A Guide to Methods and Practice, SAGE Publications Limited.
- Mushing, A. & Lourenço, F., 2013. The Evolution of ATM Fraud Attacks. Security Matters, 2(Issue 2013). Available at: <http://arm.mastercard.com/securitymatters/trends/trends-trends/evolution-atm-fraud-attacks/> [Accessed January 28, 2015].
- Roam, D., 2009. Unfolding the Napkin: The Hands-On Method for Solving Complex Problems with Simple Pictures, Portfolio, Penguin Group (USA) Inc.
- Sheets, D.J., Bradley, D.B. & Hendricks, J., 2005. Enduring Questions in Gerontology, Springer Publishing Company.
- Siddiqi, S., Groman, E. & Zedeneq, R., 2013. A New Dawn : Age-Friendly Banking, Available at: http://www.nccr.org/images/new_dawn_age_friendly_banking.pdf.

which captured the lifestyles, opinions, needs, concerns, emotions and behavioural habits of all the participants. Personas are design tools used to frame research findings and aid in the design process of generating an intervention which supports 'Older Adults' emotionally and psychologically while interacting with the self-service ATM channel as well as facilitating their independence through security and usability knowledge development.

Literature Review

Traditionally, bank's communication with customers was achieved in a branch on a face-to-face basis of interaction. This was considered to be the cornerstone of their relationship according to DiVanna (2016), that customers in this relationship interacted with the bank in two ways: use a bank teller to perform simple transactions and use a bank officer for more complex actions. 'Older Adults' prefer this traditional branch banking channel with tellers due to its familiarity and their preference for human interaction during their transaction because of the security it offers (King 2010; Snyder 2012; Siddiqi et al. 2013). However, the introduction of the 'Pass Machine' in 1980 changed the relationship dynamic between a bank and its customer. Bank customers could now perform simple transactions themselves, outside of normal banking hours, without the need of a teller or even entering a bank. Self-service technology, such as the ATM, increased customers convenience, allowing access to cash 24/7 (King 2010; Gardner 2011; Berry 2016).

The literature review concluded that banks are established in an interactive and ever-evolving relationship with the customer. This relationship is managed and interacted with through various channels, the ATM channel being one. The ATM channel is constantly adapting to new roles and requirements that the industry and customers are demanding (Flower et al. 2012). This is evident in recent years with the developed range of services available and sophistication of the technology used (DiVanna 2016; Sheets et al. 2005; Continuum 2016). The implementation of the ATMs allowed banks to reduce costs and overheads of a branch operation, distribute cash to customers, reduce congestion in branches, promote an innovative image and increase customers' convenience (Flower et al. 2012; Gardner 2011; King 2010; DiVanna 2016).

However, the approach and implementation of self-service channels have had a negative impact on several major customer segments who preferred to bank in the branch. 'Older Adults' are considered one of these customer segments that were overlooked, who preferred to frequent the bank branch as a means of communicating with financial institutions (Morrow-Howell & Sherraden 2015; Snyder 2012). By closing and reducing branch hours, face time with staff being replaced with self-service channels, traditional customers were left unsupported and there was a natural lack of understanding and vision concerning what the customer wanted out of their banking experience (Flower et al. 2012).

Banks can benefit from integrating 'Older Adults' to self-service technology because of their financial sustainability and the use of the technology allows these customers to become close to break-even profitability. 'Older Adults' who interact with technology show fewer depressive symptoms, feel less lonely and have better overall social resources (Sheets et al. 2005; Carpenter & Buday 2007; Alves 2008). Moreover, by empowering them with physical access to financial services, their economic conditions and security can be reinforced (Siddiqi et al. 2013; Morrow-Howell & Sherraden 2015).

Appropriate training and support must be offered when introducing 'Older Adults' to new channels of communication and methods of banking. It is essential that the training creates a user centred banking experience which facilitates the needs and characteristics of OA's, essentially creating a "personal 'hand-holding' service" (Dowling 2004, p.318) that addresses their personal motivations. A potential way of ensuring this experience is to consider a service design that mixes self-service technologies with human interaction.

User Centric Interaction

Before conducting the observational study into the ATM channel, it was necessary to explore and define the Human Computer Interaction (HCI) process of using an ATM from a user-centered perspective. Crouch & Pearce (2012) maintain that the user interaction of systems (in this case ATM's) is often best expressed graphically. Approaching the research with a graphic process and output in mind allowed for a more user task orientated visual to be

References

- Slevin, F., 2014. The ATM isn't dying, it's being transformed. ATM Marketplace. Available at: <http://www.atmmarketplace.com/articles/the-atm-isnt-dying-its-being-transformed/> [Accessed February 4, 2015].
- Snyder, D.R., 2012. Elder Crimes, Elder Justice, Jones & Bartlett Learning.
- Sommerville, I., 2004. Software Engineering (7th Edition), Pearson Addison Wesley.
- Sommerville, I., 2010. Software Engineering (9th Edition) 9th ed., Harlow, England: Addison-Wesley.
- Wasson, C., 2000. Ethnography in the field of design. Human organization, 59(4), pp.377–388. Available at: <https://designstudiesdiscourses.files.wordpress.com/2013/09/wasson-ethnography-in-field-of-design.pdf>.

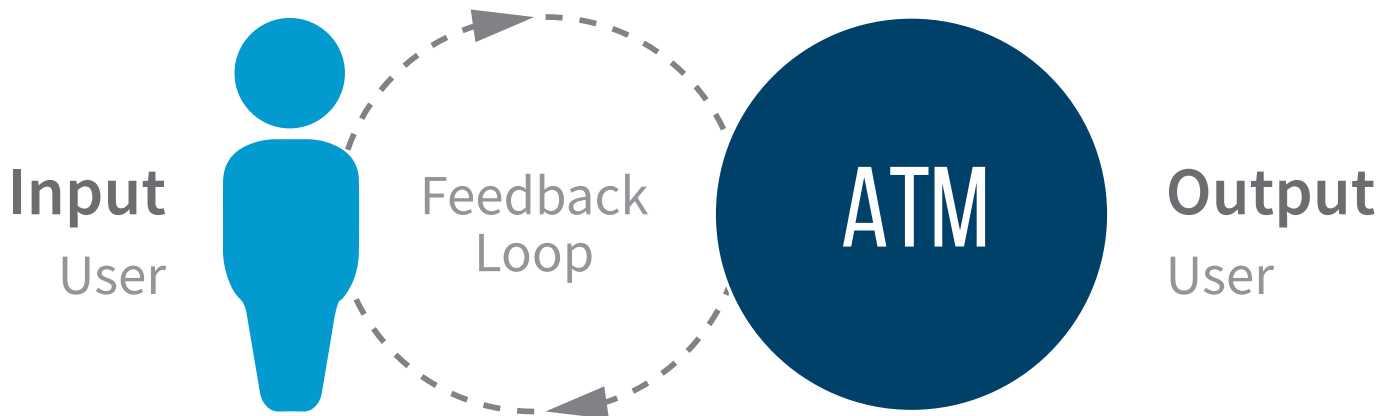
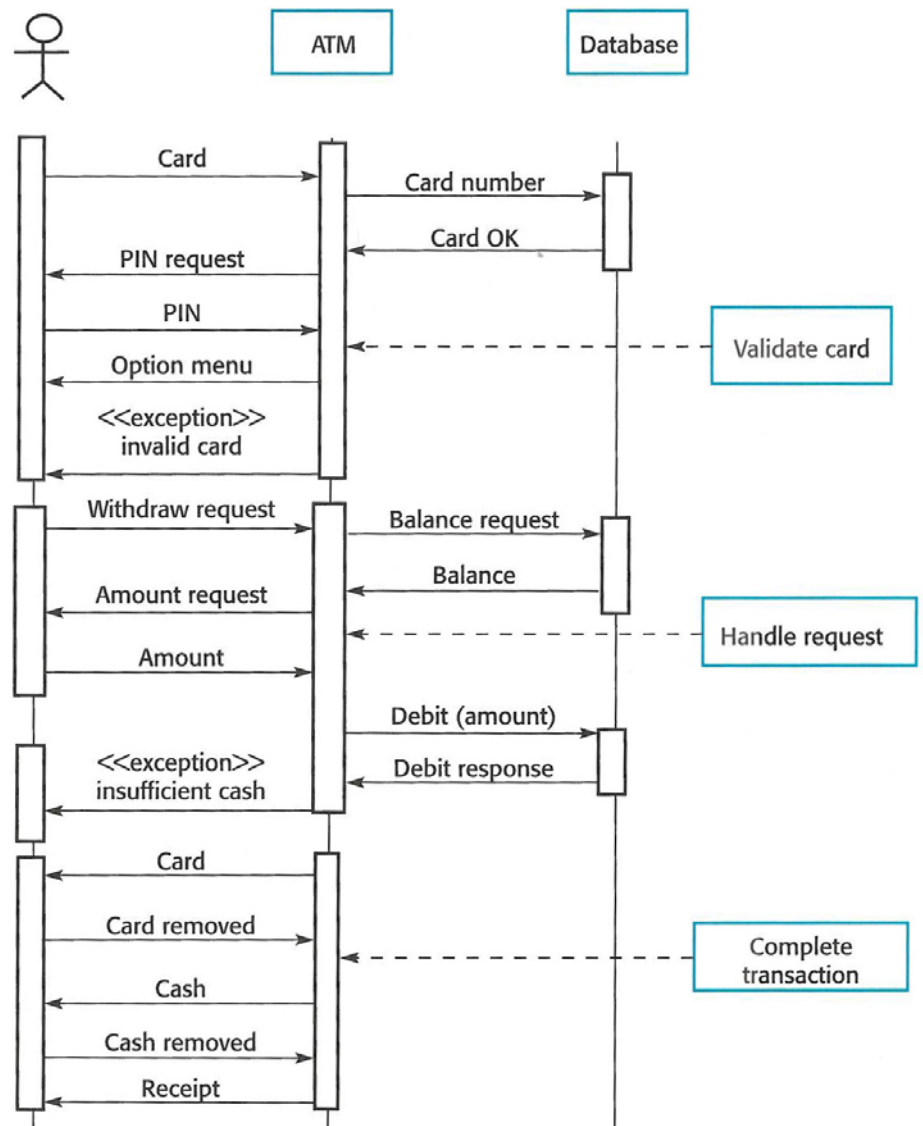


Figure 2: Archetypal Structure

generated, displaying the user interaction input and machine output. HCI is most commonly described as the study of the interaction between humans and computers (Booth 2014). Dubberly et al. (2009) maintains the interaction between a user and an ATM is based on an archetypal structure of a feedback loop between input and output in an interactive feedback loop, as seen in Figure 2.

Similarly, Sommerville (2010) states that users and ATMs interact an input and output loop. However, there is also a degree of processing involved. This processing is the database of the ATM system being accessed to verify the users identity and process the task. Through sketching and mock-ups, Sommerville's (2004) sequence diagram (Figure 3) was adapted to map the key steps on the HCI input and output process for ATM's to create a user-focused model (see Figure 4), displaying an archetypal structure of input and output as proposed by Dubberly et al. (2009). This diagram displays the interaction of a user as they process the task of the main transaction, its goal being to obtain money.

Figure 3: Sequence Diagram. Source: (Sommerville 2004, p.134)



Observational Study

The objective of the observational study was to observe product related behaviours of people interacting with public ATMs. This allowed for qualitative data to be collected on user behaviour and product usability (Cooper et al. 2014). Wasson (2000) states that use of observational techniques reveals a whole new dimension to users and their everyday behaviours with products. These behaviours presented new data relating to the gap of knowledge which was acknowledged prior to the research activity beginning. The observations were collected through unobtrusive note-taking and sketching. Martin & Hanington (2012) state that this approach allowed documentation to be as natural and unstaged as possible.

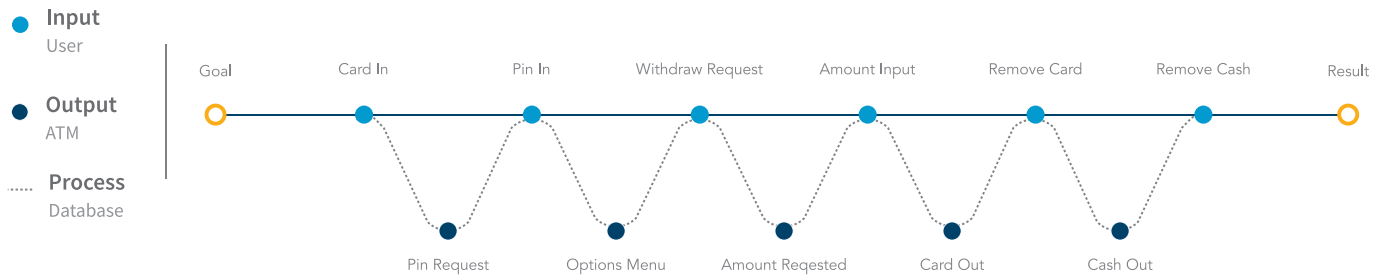


Figure 4: Developed User Focused Sequence Diagram



Figure 5: Affinity Diagram - Early sketch work of layout and process

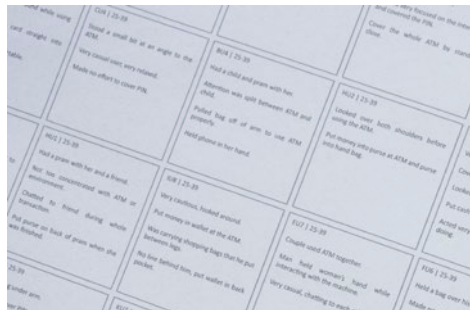


Figure 6: User Statements (left) - Derived from Observations Notes (right)

The analysis and synthesis of the qualitative and quantitative data needed to be approached by a methodology that would facilitate a mixed method approach. The creation of an Affinity Diagram was chosen as the most appropriate method to obtain the necessary data that would facilitate the creation of design personas grounded from the observed users. An Affinity Diagram is a visually based method of coding used to “externalise and meaningfully cluster observations and insights from research, keeping design teams grounded in data as they design” (Martin & Hanington 2012, p.12).

Making Sense of User Behaviour

The design discipline actively engages in visual methods of problem-solving. This is considered a central component to all phases of the design methodology, from early research in understanding user needs to final design intervention (Margolis & Pauwels 2011). The user behaviour data from the observational study was organised into behaviour themes by generating an affinity diagram. This allowed for the research activity to identify user needs and behaviours while users interact with the ATM. Figure 5 shows early sketch work of the affinity diagrams layout and process. The first phase of the affinity diagram was informed by Martin & Hanington (2012) and involved the creation of User Statements. These User Statements were a recording of the research observations, summarising the user’s key behavioural actions whilst engaging with the ATM (see Figure 6). In total, there were 87 User Statements generated, all of which were given their own individual squares and clustered into their appropriate demographic quadrants.

Phase two of the diagram involved developing the User Statements into

Behaviour Statements. The research at this point focused on ‘Older Adults’, as ATM users. The demographic profiles were segmented into four distinct age groups as seen in Table 1. The 40-59 and 60+ segments of users were utilised to supply a wide range of statements based on ‘Older Adults’ because of the small number of 60+ user observed.

Behavioural statements were recorded by the researcher in a sentence format involving “the user”, an “action” and an “outcome”, e.g. “ATM users look around their environment before taking money” (Lockton & Harrison 2012). These statements were placed on post-it notes, which facilitated the next and final phase. This resulted in 124 behavioural actions of user interaction with the ATM being identified as seen in Figure 7. These habits were informed statements of thoughtless acts carried out by the users, revealing how they behaved when interacting with the ATM.

The final phase of the diagram involved coding the Behaviour Statements further into Positive and Negative behavioural groupings. This process of coding and identifying patterns is referred to as ‘behavioural personas’. Lockton (2013) states that this process is about “findings patterns in the different ways that different people use the same product or system, and clustering them into something like ‘specifications’ for how each cluster is likely to behave with that or similar systems.” With that, the research activity utilised positive and negative specifications relating to how transactional security and product usability are affected to code the behavioural statements. The affinity diagram allowed the qualitative from the observational study to be synthesised into behavioural groupings which can be seen in Table 2 coded into positive and negative.

Demographic Group:	-24	25-39	40-59	60+	Total
No of Users Observed:	4	46	29	8	87

Table 1: User Statements – Breakdown to users observed.

(H2) Positive Behavioural Statements:

Code		Code	
A.P.01	ATM users empty their hands before using.	B.P.05	ATM users look back at the ATM to double check.
A.P.02	ATM users always have their cards ready.	B.P.06	ATM users put their card away at the ATM.
A.P.03	ATM users look around their environment.	B.P.07	ATM users place card and money away before leaving.
A.P.04	ATM users step in and away while imputing PIN.'	B.P.08	ATM users hold onto their wallets.
A.P.05	ATM users use their belongings to cover their PIN.	B.P.09	ATM users stand close to the machine.
A.P.06	ATM users cover their PIN.'	B.P.10	ATM users watch their surroundings.
A.P.07	ATM users look around before taking their money.	B.P.11	ATM users are looking around while using the machine.
B.P.01	ATM users put away their money straight away.	B.P.12	ATM users watch their surroundings.
B.P.02	ATM users put money straight into their bags.	B.P.13	ATM users secure their belongings.
B.P.03	ATM users hold their bags and purses.	B.P.14	ATM users look left and right of the machine.
B.P.04	ATM users are organised.		



Figure 7: Affinity Diagram
User Statements sit in the centre,
surrounded by Behaviour Statements

(H2) Negative Behavioural Statements:

Code		Code	
A.N.01	ATM users get frustrated while waiting for their turn.	B.N.06	ATM users take cash and walk.
A.N.02	ATM users distract themselves while waiting.	B.N.06	ATM users don't take time to put money away.
A.N.03	ATM users need to root for their card.	B.N.07	ATM users put money away after leaving.
A.N.04	ATM users make minimal contact with the machine.	B.N.08	ATM users flinch when people walk past.
A.N.05	ATM users have trouble reading the screen.	B.N.09	ATM users act awkward around the machine.
A.N.06	ATM users forget their PIN.	B.N.10	ATM users talk to others while using the machine.
A.N.07	ATM users find it difficult to see the screen.	B.N.11	ATM users hold conversations while using the machine.
A.N.08	ATM users lean into the machine to see the screen.	B.N.12	ATM users talk on their phones.
A.N.09	ATM users lean over to see the screen.	B.N.13	ATM users use their phones.
B.N.01	ATM users stand away while taking the card out.	B.N.14	ATM users get distracted by other users.
B.N.02	ATM users walk away while putting away money.	B.N.15	ATM users are always rushing to finish.
B.N.03	ATM users don't pay attention at the machine.	B.N.16	ATM users leave the machine hesitantly.
B.N.04	ATM users get frustrated with the machine.	B.N.17	ATM users leave with hands in pockets.
B.N.05	ATM users use it with one hand.		

Table 2: Affinity Diagram – Positive and Negative user behaviour statements.

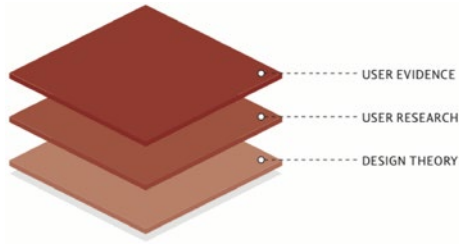


Figure 8: Validation Stack - Used to defend a design.
Source: (Bowles & Box 2010, p.121)

Validating User Behaviour Visually

To validate the discovered behaviours and their relation to transactional security and the product usability of ATM's, a visual method of 'layering' was identified as an approach that would best express the system HCI graphically (Crouch & Pearce, 2012). This visual method of layering, coined for the purpose of the research as 'Layered Validation', was informed by combining the methods of Bowles & Box's (2010) and Dan Roam (2009). Bowles & Box (2010) Validation Stack method is an approach used to defend User Experience (UX) web designs. UX design is focused on the user's overall experience and ease of using a product, such as a website or a computer application. The Validation Stack method is an approach to prove a proposed UX design by supporting the design with conclusions and rationales derived from User Evidence, User Research and Design Theory (see Figure 8). This method of validating research part influenced the Layered Validation.

responded to the user's input, such as Enter PIN or select money amount. The third layer relates to the potential of criminal activity by a third party and transitional security of the users because of this intervention. This displays the points during the process in which criminals mount skimmer devices pre-user interacting or obtain users PIN during their interaction. The behaviour layers (positive and negative) derived from the observation study and synthesised by the affinity diagram, displayed habits that users carried out while interacting with the ATM. Layer four relates to habits which stop criminal activity e.g. covering the PIN pad. The negative behaviour layer relates to habits that can invite criminal activity e.g. not being vigilant or covering PIN.

The sequential structure was informed by the works of Sommerville (2004), and Dubberly et al. (2009), previously mentioned in the literature review which was developed into a user-centered sequential framework of interaction with ATMs. The finished layered validation visual created an holistic interaction diagram displaying the user's behaviour and the process of using an ATM, as well as associated criminal activity. This allowed for relationships and connections to be identified between the identified layers. In doing so, it validated that negative user behaviour allows for criminals to capitalise and gain access to the user's personal data and money and that positive behaviour stops the third party from criminal activity against the 'Older Adults'. Figure 11 shows the finished layers printed separately on acetate paper and layered upon each other and Figure 12 shows an illustrated graphic.

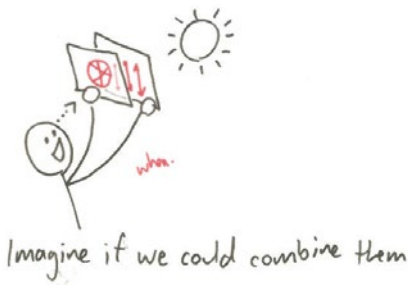


Figure 9: Combining Tools - Layering 6x6 and SQVID method of analysis to visualise problems. Source: (Dan Roam 2009, p.227)

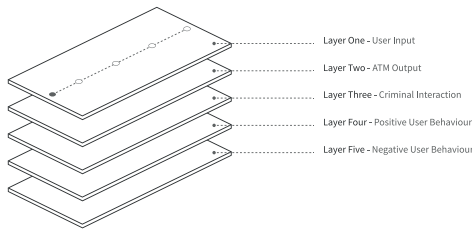


Figure 10: Structure of sequential graphics and layered validation visual

Roam (2009) maintains that by visually describing a problem it can be better understood. He has developed many methods of visual thinking and analysis that allow this understanding. Roam discusses the concept of combining different visual methods of exploring and analysing problems to identify solutions from multiple sources (see Figure 9). This idea of layering visual methods to analyse problems and identify solutions also influenced the Layered Validation.

The combination of Bowles and Box's tiered method of validating / defending designs and Roam's visual analysis of problems allowed for the creation of an holistic interaction diagram, displaying the user's behaviour and the process of using an ATM. It also displayed the criminal activity by a third party, which takes place at the channel. The user-focused model of Sommerville's (2004) sequence diagram of ATM withdrawals was used as a base framework to build the visual on. The content was framed sequentially and tiered into five layers: User Input, ATM Output, Criminal Interaction, Positive User Behaviour and Negative User Behaviour (see Figure 10).

The first layer displays the user input of the interaction with the ATM, such as entering their PIN or extracting money. The second layer displays the output of the ATM as it

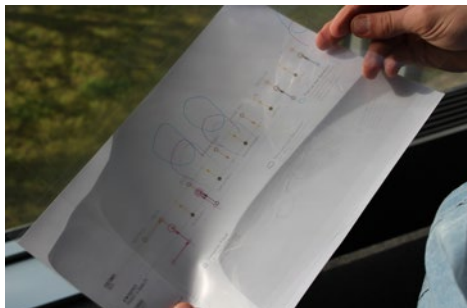


Figure 11: Structure of sequential graphics and layered validation visual

Applying Behaviours To Personas

As previously stated, the design discipline actively engages in visual methods of problem-solving. This visual method informed the approach of engaging with the user behaviour data collected from this observational study. The research activity utilised the combined method of Bowles and Box's tiered approach to validating / defending designs and Roam's visual analysis of problems. This allowed for the creation of an holistic interaction diagram displaying the user's behaviour and the process of using an ATM, as well as associated third party criminal activity. It also allowed for relationships to be identified between the

layers and went on to inform the creation of design personas of Older Adults. These personas were used during the design phase of the project to identify design opportunities and provide direction to optimise and enhance the self-service teller.

The personas were informed and grounded by the synthesised data obtained during the observational study which was validated through 'layered validation'. The affinity diagram allowed the data to be coded into

negative and positive behavioural activities, which related to security and safety at the ATM channel. By utilising this approach, it was possible to create personas that are grounded on real-world observations (Cooper et al. 2014). The user behaviour statements previously generated on conclusion of the affinity diagram was further synthesised by coding into pre-interaction, interaction, post-interaction and holistic interaction which can be seen in Table 3.

Figure 12: Structure of sequential graphics and layered validation visual

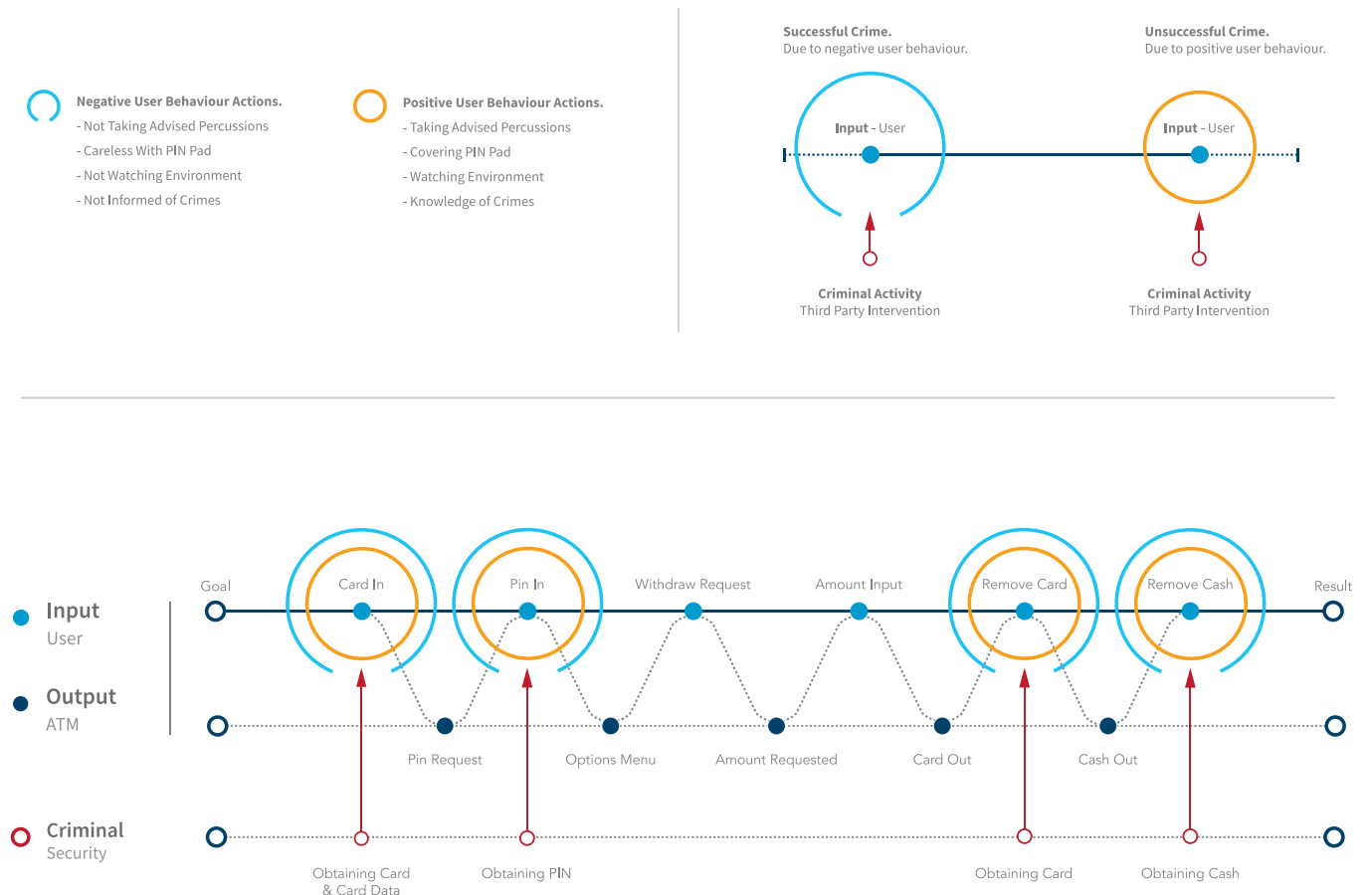


Table 3: Coding negative and positive user behaviour into interaction stages

Persona 1 - Positive Behavioural Statements:

Pre-Interaction		Interaction	Post-Interaction	Holistic Interaction
Code			Code	
A.P.01	ATM users empty their hands before using.		B.P.05	ATM users look back at the ATM to double check.
A.P.02	ATM users always have their cards ready.		B.P.06	ATM users put their card away at the ATM.
A.P.03	ATM users look around their environment.		B.P.07	ATM users place card and money away before leaving.
A.P.04	ATM users step in and away while imputing PIN.'		B.P.08	ATM users hold onto their wallets.
A.P.05	ATM users use their belongings to cover their PIN.		B.P.09	ATM users stand close to the machine.
A.P.06	ATM users cover their PIN.'		B.P.10	ATM users watch their surroundings.
A.P.07	ATM users look around before taking their money.		B.P.11	ATM users are looking around while using the machine.
B.P.01	ATM users put away their money straight away.		B.P.12	ATM users watch their surroundings.
B.P.02	ATM users put money straight into their bags.		B.P.13	ATM users secure their belongings.
B.P.03	ATM users hold their bags and purses.		B.P.14	ATM users look left and right of the machine.
B.P.04	ATM users are organised.			

Persona 2 - Negative Behavioural Statements:

Pre-Interaction		Interaction	Post-Interaction	Holistic Interaction
Code			Code	
A.N.01	ATM users get frustrated while waiting for their turn.		B.N.06	ATM users take cash and walk.
A.N.02	ATM users distract themselves while waiting.		B.N.06	ATM users don't take time to put money away.
A.N.03	ATM users need to root for their card.		B.N.07	ATM users put money away after leaving.
A.N.04	ATM users make minimal contact with the machine.		B.N.08	ATM users flinch when people walk past.
A.N.05	ATM users have trouble reading the screen.		B.N.09	ATM users act awkward around the machine.
A.N.06	ATM users forget their PIN.		B.N.10	ATM users talk to others while using the machine.
A.N.07	ATM users find it difficult to see the screen.		B.N.11	ATM users hold conversations while using the machine.
A.N.08	ATM users lean into the machine to see the screen.		B.N.12	ATM users talk on their phones.
A.N.09	ATM users lean over to see the screen.		B.N.13	ATM users use their phones.
B.N.01	ATM users stand away while taking the card out.		B.N.14	ATM users get distracted by other users.
B.N.02	ATM users walk away while putting away money.		B.N.15	ATM users are always rushing to finish.
B.N.03	ATM users don't pay attention at the machine.		B.N.16	ATM users leave the machine hesitantly.
B.N.04	ATM users get frustrated with the machine.		B.N.17	ATM users leave with hands in pockets.
B.N.05	ATM users use it with one hand.			

	Doreen Quinn: Positive behaviour while interacting with ATM channels.	George O'Shea: Negative behaviour while interacting with ATM channels.	Breda Kennedy: Does not engage with ATM channels.
User Behaviour:	Doreen characterises OAs who show positive behavioural characteristics while engaging with self-service teller machines.	George characterises OAs who show negative behavioural characteristics while engaging with self-service teller machines.	Breda characterises OAs who choose not to engage with self-service teller machines.
User Motivations:	Doreen is willing to develop her knowledge at the channel and perhaps move onto other self-service channels.	George needs to be informed on the proper security precautions that he needs to implement while interacting with the channel. George can also benefit greatly from developing his knowledge with the technology at the channel and perhaps move onto other self-service channels.	Breda needs to be emotionally supported within the banking community if she is going to engage with self-service channels and products. Breda can also benefit greatly from interacting with and learning new technology. Breda will also need to be informed on her behaviour once she has engaged to ensure that she is taking the proper precautions while using an ATM.

Figure 13: Design Personas

Table 4: Coding negative and positive user behaviour into interaction stages.



Persona Overview

The three completed personas captured the behaviour patterns of 'Older Adults' regarding their engagement, or lack of, with the self-service teller channel (ATMs) at financial institutions (Figure 13). The creation of the design personas highlighted user motivations and behaviours which can be seen in Table 4. The personas were used to capture the behaviour of the users observed previously in the observational study. The purpose of these personas was to act as design tools, to frame research findings and aid in the design process of generating an intervention supporting 'Older Adults' emotionally and psychologically, while interacting with the self-service ATM channel as well as facilitating their independence through security and usability knowledge development.

Conclusion and Reflection

As perviously stated, the field research bridged the gap of knowledge by collecting data from a multiple of sources, such as focus groups, observational studies and literature.

The mixture of qualitative and quantitative data was used to create design personas, representing 'Older Adults' who interact and do not interact with ATMs. These personas all embody user behavioural habits, observed during the observational study and embodied who 'Older Adults' engaged with during focus groups (which was not reported on in this article), creating new grounded knowledge. The persona behaviours were segmented into two groupings. Personas who interacted with ATMs with positive behaviour, preventing criminal activity and those who interacted with negative behaviour making users more open to criminal activity.

The resulting personas and their individual behaviours were supported by the work of Lockton (2013) which identified that people ('Older Adults') interact with the same product (ATM's) in different ways, and that it was possible to cluster them into 'specifications' (positive and negative behaviour) of how they were likely to behave with similar systems

(other self-service technology). The personas behaviours were rationalised and framed by the layer validation visual. The new knowledge was applied by analysing the existing product and services offered by banks, resulting in the identification of a service concept that addressed the needs of the personas.

Throughout the research and design phase, a variety of methods were used to gather, synthesise and analyse data. These methods used visual coding, mapping and sketching and were chosen because of their graphical and tangible attributes. The combination of these visual approaches led to the layered validation visual and the positive / negative behavioural coding outcome of the affinity diagram being generated. It is hoped that the layered research validation methods will aid other research in identifying and visualising user behaviour issues related to HCI, while also providing a UX framework to design interventions which are focused on addressing the needs of users.