Parentull – Simple Software for Family Organisation

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Mr. Edward Charles Richmond

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Abstract

Low income families currently face significant issues accessing legal aid if a conflict arises. It is well established that without access to legal representation and fair justice, conflict will go unresolved or escalate impacting on child welfare and psychology. Parentull aims to address this problem through the use of cross-platform technology to allow all family members to aid in harmonising conflict where parties cannot access the justice system.

Research was conducted into avenues for a technical solution as well as the background domain regarding legal and professional duties. The result was a changed, yet clearly defined objective to create a solution to the problem offering a forward thinking and future proof approach to app development.

An application was created to facilitate family organisation using multiple data points, such as extra-curricula activities, medicine, rules and emergency contacts. Analysis is made of the application with critical conclusions being drawn of the professional viability of the alpha version of the application.

Thanks to

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1   Introduction

The Office of National Statistics (ONS) data for 2020 shows that there were "*2.9 million lone parent families in 2020, which accounts for 14.7% of families in the UK*" (*Families and households in the UK - Office for National Statistics*, 2020) this coincides with data from 2018 where ONS stated "*The number of cohabiting couple families continues to grow faster than married couple and lone parent families, with an increase of 25.8% over the decade 2008 to 2018*" (*Families and households in the UK - Office for National Statistics*, 2018).

Whilst the number of married couples remains the most common; lone parent and cohabiting families continues to grow year on year at a time when the ability of such families to seek legal recourse in the event of disputes has been significantly damaged by the revocation of Legal Aid and the financial barrier to instructing a counsel privately is almost impossible to overcome for such families. Families who do overcome the barrier are also at risk of dropping below the poverty line as discussed in section 2, subsection 2.2.1. Legal aid revocation was imposed "*on the falsehood that we (the United Kingdom) have "the most expensive legal aid system in the world". This is quite simply a lie.*" (Barrister, 2018) "*The average take-home pay of a legal aid criminal barrister is £27,500*" (Barrister, 2018) comparatively less than Teachers, Paramedics, Nurses, Midwives, Podiatrists, Health Service Managers, Electricians, Human Resources Professionals, Office managers and Graphic Designers. (Baxter-Wright, 2021)

Societal attitudes towards sexual relationships and having children outside of long term, stable relationships have become progressively relaxed accounting for the decoupling of the nuclear family. Dating in the modern world is unlike former generations have experienced given the prevalence of apps such as Tinder, Bumble, Match and Facebook Dating. These apps encourage a 'hook up' culture where short term gain > long term relationships. The natural result are statistics as mentioned above.

Further compounding the issue is a lack of forward-thinking legislation in respect to these developments in society and an underutilisation of technology to ensure parents can give children the very best start in life.

With increasing numbers of lone-parent and cohabiting families; the motivation for the project becomes clearer in that society will need an improved way to deal with family conflict given the decoupling of traditional family groupings and a lack of legal recourse in the event of a dispute regarding children.

This project stems from the authors own experience of the issues having self-litigated at family courts and worked with satellite agencies, such as Safeguarding, CAFCASS and school. Throughout his experience, the author noted the subjective nature of information being considered by authorities, a lack of cohesion between agencies and almost no objective data consideration.

It is the authors hope that through exploring how technology can assist family conflict that a more progressive family dispute resolution and organisation system can be formulated.

1.1   Why is Parentull needed?

Legal & Governance research provided in Section 2.2, subsection 2.2.1 in respect to LASPO shows that a vast proportion of the population are unable to access legal aid if a child contact issue arises and the parties cannot reconcile their differences. Further, in cases where parties cannot afford to

appointment private legal counsel, they must represent themselves at court and risk escalating their issues beyond repair.

By using technology to involve wider family members, help parties communicate and providing methods to evidence child welfare, care, contact and safety through objective data, as opposed to subjective views, Parentull can aid families to resolve their disputes, save money and break the cycle of conflict.

1.2   Project Beneficiaries

Parentull will benefit adults in conflict by saving money on legal fees; these fees range from £3000 to £20,000 on average. In comparison, Parentull could be provided to families for a small monthly charge per person, or even for free if funded via a local authority given doing so would be more cost effective than the entire costs of conducting a court case. Table A shows the cost break down:

Legal Costs with Court Costs	Parentull Cost
Party A – Solicitor Costs: £3000 Party B – Solicitor Costs: £3000 Court scheduling costs : £100-200~ CAFCASS report generation : £100-150~ Court administration costs : £20~	£9.99 per month per person £79.92 per month per family of 8 persons £959.04 per year per family of 8 persons.
Total: **£6020-£6370**	**£959.04**

Table A: Cost Breakdown, assuming minimum costs for legal costs.

In cases where an adult must represent themselves, Parentull will enable data collected through the software to be referenced to the court. As the data will be objective, as opposed to subjective, this data will be more likely to convince a judge of the legitimacy of the argument. One example being where a party can evidence that they arrived for contact by checking in via GPS or scanning a location specific QR code. Another being activity within the family 'circle'.

Where there is conflict, Parentull will benefit adults by recommending mental health and gender specific services which is important as seen in Section 2, subsection 2.1 and subsection 2.1.1, subsection 2.1.2.

Parentull will benefit extended family members by enabling them to connect with child/ren in their families and by enabling them to ensure that parties in conflict are putting the needs of the child first using objective data; creating a modern version of the Child Welfare Principle noted in Section 2, Subsection 2.2.2.

Parentull will be a major beneficiary to families who need more organisational skills as it provides a means to organise information about children, tasks and other important information in one place thus saving time for each family member involved.

Children will benefit from being able to use Parentull to keep in touch with all of their family members ensuring their "hierarchy" of needs, as per Figure 3 in sub section 2.1.2.

Professional services, such as the police, social services, schools and medical professionals could benefit by being able to access objective, rather than subjective, information about families where child related issues arise in isolated or collaborative incidents. Whilst it is beyond the scope of this project, it could be foreseen that benefits to these services could be in the form of being able to analyse data about family events if an allegation is made. For instance, where a child discloses that they have been the victim of sexual or physical abuse, agencies could use Parentull's data to analyse whether an adult and child were in proximity to each other at the time of the abuse.

1.3 Project Aim

The overall aim of this project is to create a platform through which various elements of family life can be managed. The application should allow users to view information from a central circle and about children, tasks, clubs and other associated objects.

The project should implement primary objectives first, and if time is available secondary and tertiary objectives.

1.4 Primary Objectives

The primary objectives, which will determine success for Parentull are:

1. **Conduct user research and create user requirements (e.g. user stories, views) based on the outcome of research.**
   Understanding the needs of the user will be paramount to modelling data and creating pathways / views which are helpful to both helping families become more organised and resolving conflict.
2. **Consider in-app data which needs to be collected or is required from members and use normalisation to reduce data duplication.**
   The data minimalization principle of GDPR requires that systems reduce the amount of data processed; this can be partially achieved through consideration of data duplication and normalising to reduce such data.
3. **Create an alpha version of Parentull for web**
   An Alpha version of Parentull should allow users to sign up and use CRUD (Create, Read, Update, Delete) actions to manage various types of information as relevant to user stories and research.
4. **Integrate 2FA (Two Factor Authentication) into the alpha version.**
   Users should be able to activate Two-Factor authentication on their account via a string of text or QR code.
5. **Ensure compliance with GDPR by building an automatic 'Subject Access Request' feature whereby members can generate a .zip of their data.**
   Users should be able to request a copy of their data by pressing a button. Upon being pressed, the users data should be gathered into an easy to access format and made available for download.

1.5 Secondary Objectives

The secondary objectives are objectives that shall be completed when the primary objectives are completed. They do not form the basis of the projects success or failure.

1. **Create an alpha version of Parentull for Android**
   Migrate the alpha version to an alpha android version which should have all of the functionality of the web version.
2. **Create an alpha version of Parentull for iOS**
   Migrate the alpha version to an alpha iOS version which should have all of the functionality of the web version.
3. **Create Cross Platform versions of Parentull for Desktop**
   Migrate the alpha version to Desktop which should have all of the functionality of the web version.

4. **Create an API which third parties, such as data controllers/processors can use to provide information to members of Parentull**

   An API allowing third party data controllers to provide data to users of Parentull, providing consent had been obtained should be created to allow for further benefits to users.

1.6 Tertiary Objectives

Tertiary objectives are objectives that will be considered in the event that all primary and secondary objectives are completed. They do not form the basis of success or failure.

1. **Create a monitoring system for abuse/abusive members.**

   Activity which is considered abusive or violates the terms of service of Parentull should be actively monitored. This behaviour should be logged to determine patterns and potential safeguarding issues.

2. **Integrate filters which:**
   a. Prevent curse/abusive words being added to content within Parentull.
   b. Make suggestions based on the 'current' user view.
   c. Determine if a user has inputted correct or incorrect information – e.g. checking in at a location, but has faked their GPS location.

2   Literature review

Parentull seeks to explore how technology can aid families in organisation and re-focus dysfunctional human relationships to be symbiotic following damaging or parasitic events. For the purposes of this dissertation, Parentull's use cases will revolve around those in Appendix B, whilst considering families who are or have been in conflict within the United Kingdom where the routes back to symbiosis following relationship breakdown have multiple barriers and are often not effective owing to traditional routes leading to further conflict which impact heavily on family dynamics and child development. For this purpose, the Literature review will cover the Human Element, Legal & Governance, Existing Products and Software Development.

It is essential to consider the human element and legal & governance domains as software could have the inverse effect to its proposed outcome should conflict be escalated through the software or data, therefore it is critical that any software produced can operate to the standards within the legal frameworks.

2.1   The Human Element

This section of the literature review focuses on the Human Element, widely recognised as the single biggest vulnerability in every system to date; computerised or otherwise.

The Human Element is the changing state of human emotion, psychology, thought, beliefs, desire and loyalties. In most cases, it dictates whether a human can be manipulated or is the manipulator. "*Testifying before congress not long ago, I explained that I could often get passwords and other pieces of sensitive information from companies by pretending to be someone else and just asking for it*" (Mitnick, 2002). "*In most cases, successful social engineers have strong people skills, they're charming, polite and easy to like – social traits needed for establishing rapid rapport and trust.*" (Mitnick, 2002).

There are cases where manipulation does not form the basis of the Human Element; consider the disclosure by former NSA analyst Perry Fellwock of the ECHELON surveillance system in 1972 (*The New York Times*, 1972); followed by "The NSA Files" (MacAskill *et al.*, 2013) leaked by Edward Snowden in 2013 after he became "disillusioned" with programs run by the intelligence organisation. Several years after The NSA Files, a US court ruled the programs illegal. (*Washington Post*, no date)

2.1.1   Co-operation v Self-Interest

Cooperation is the cornerstone for symbiotic relationships because it allows organisms to grow and thrive instead of working independently. An example can be seen between that of the Clownfish and Anemone where "*the anemone provides the clownfish with protection and shelter, while the clownfish provides the anemone nutrients in the form of waste while also scaring off potential predator fish*" ("Symbiosis: The Art of Living Together," n.d.).

Such relationships can also exist between Fungi and Plants wherein *:* (Multiple to Multiple relationship) nutrient exchange symbiosis exists. One key differential is that Fungi and Plants can turn Symbiosis into a Parasitical relationship; when this occurs, either organism can choose to disrupt the nutrient exchange by withholding nutrients through '*arbuscular mycorrhizal symbiosis*' (van't Padje, Werner and Kiers, 2021) until an increased 'price' is met for the exchange to continue; or by invading cells and external nutrient supplies to make a symbiotic partner dependant on the parasitic actor (Welle, 2021).

Figure 1 - A diagram of Societal (Symbiotic) interests verses Individual interests (Schneier, n.d.)

Human relationships operate on the same symbiotic and parasitical system despite being much more complex. Figure 1 depicts the hierarchy of interests which Humans (Actor) subconsciously enact to maintain symbiosis with wider society whilst furthering individual interests. If a Human opts for self-interest acting differently from the 'Group norm', they have "*Defected*" (Schneier, n.d.). In the example of NSA defectors, their motivations were group interest rather than self-interest and those motivations do appear to have been validated given data collection in programs exposed by Snowden was ruled 'illegal' on September 2nd, 2020 (*Washington Post*, 2020)

In context to Parentull, if human self-interest takes precedent, be it in the form of manipulating software (e.g. inputting incorrect information) or not using the software; this would be considered "The Human Element"; however it must be recognised that use must be voluntary and that family life may not always fit within the confines of pre-determined datasets, algorithms or filters.

2.1.2   Co-operation v Conflict

In a domestic setting, defection can be small - such as a child refusing to get dressed or brush their teeth. When such defection occurs, an adult might correct the child by encouraging them to adhere to the group norm; firstly because it serves the child well to be dressed and have their teeth brushed (self-interest) but also because it is a societal norm (group interest) that a person is presented in clothing and with good hygiene.

Figure 2 - Emotional Loop (Richmond, 2019.)

On a much larger scale, Defection can take the form of family violence - - *such as domestic abuse, sexual assault, coercive control or financial control* - resulting in emotional and psychological damage. Eric J. Mash & David A. Wolfe, authors of Abnormal Child Psychology state "*Family violence occurs in numerous forms, from mild acts of frightening or*
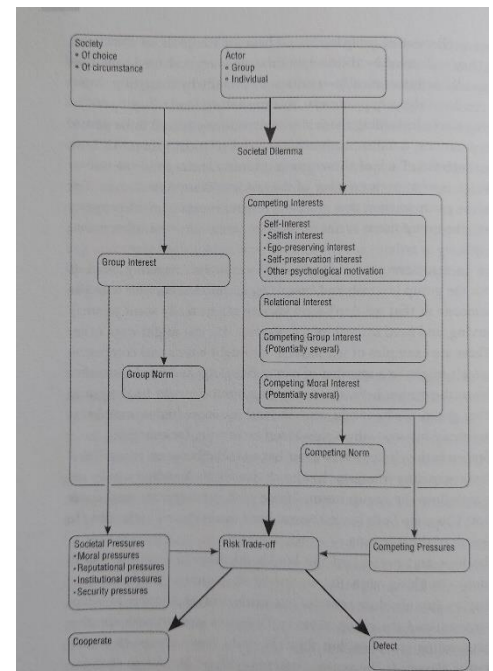
yelling at children, to severe acts of assaulting them with fists and weapons. Moreover, violence and abuse wax and wane in a cyclical manner that creates tension, uncertainty and fear in children, forcing them to cope with harsh realities and fearful demands".

Such an emotional cycle can be seen in Figure 2. The "Emotional Loop" proposed by Richmond encompasses all relationships. The key is a form of emotional damage which causes communication breakdown leading to a negative escalation in events. The emotional loop comes as a result of a lack of communication and unanswered questions which causes the cycle to repeat over and over causing emotional damage whilst furthering conflict.

Emotional loops can also be amplified depending where a person is on Maslows Hierarchy of needs, as seen in Figure 3. (Mcleod, 2020)

Erin Pizzey, founder of the Refuge Movement, suggests that such cycles can occur on a generational basis whereby defector family members can pass those traits onto younger generations which results in the cycle continuing over mutiple generations. (Cassie Jaye, no date)

Figure 3 Maslows Heirarchy of Needs is the motivational theory in Psychology comprisng of the 5 basic human needs. (Mcleod, 2020)

What is social engineering?

Social engineering is the art of 'getting people to do what they wouldn't ordinarily do' – in essence, manipulation. Cyber Security experts use this term when attempting to penetrate a target via the 'Human Element'. When applied to the context of this dissertation, a defector could, for example, convince a partner that they are at fault for the defectors actions.

Larger defections create a Co-operation v Conflict dynamic. In such an event, The Human Element is likely to be more prevelant than at any other time.

2.2   Legal & Governance

This section of the literature review focuses on Family Law, Child welfare, Data Protection and professional guidelines. Understanding the law, in addition to the benefits and pitfalls of the structure it provides, as well as professional obligations will be pivotal to developing Parentull in a legal and regulated capacity.

2.2.1   LASPO

The Legal Aid, Sentencing and Punishment of Offenders Act (LASPO) (*Legal Aid, Sentencing and Punishment of Offenders Act 2012*, 2013) enacted in 2013 halted access to legal aid across several sectors, including Family Law.
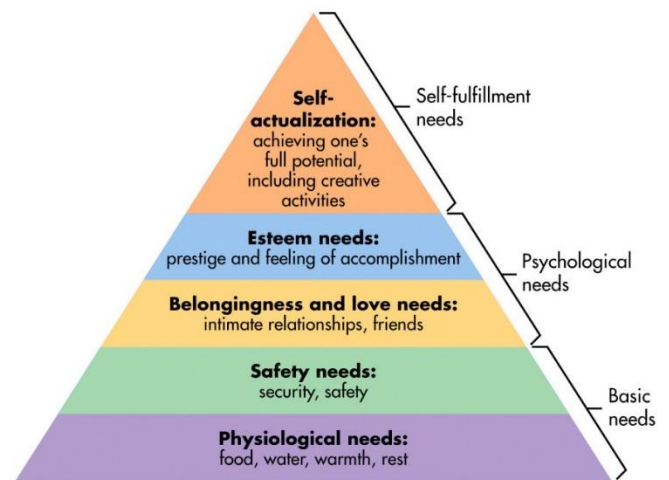
The impact of LASPO in the family law sector is that many parents can no longer access legal aid for contact cases except where exemptions apply, as seen in the Scope of Family Proceedings Under Laspo (*Scope of Family Proceedings Under LASPO*, no date), one such case is if the applicant

Type of evidence	Evidence in relation to another person
Schedule 1(para 1) Arrest for a relevant domestic violence offence	Y
Schedule 1 (para 2) Relevant police caution for a domestic violence offence	Y
Schedule 1 (para 3) Relevant ongoing criminal proceedings	Y
Schedule 1 (para 4) A relevant conviction for a domestic violence offence	Y
Schedule 1 (para 5) Bind overs connected with a domestic violence offence	Y
Schedule 1 (para 6) Domestic Violence Protection Notice	Y
Schedule 1 (para 7) Relevant protective injunction	Y
Schedule 1 (para 8) Undertaking	Y
Schedule 1 (para 9) Finding of fact	Y
Schedule 1 (para 10) Expert report produced as evidence for court/tribunal	Y
Schedule 1 (para 11) Letter or report from an appropriate health professional	N
Schedule 1 (para 12) An appropriate health professional referral to a domestic violence support service	N
Schedule 1 (para 13) Multi agency risk assessment conference (or other local safeguarding forum)	N
Schedule 1 (para 14) Letter from an independent domestic violence advisor/advocate	N
Schedule 1 (para 15) Letter from an independent sexual violence advisor/advocate	N
Schedule 1 (para 16) Letter from local authority or housing association	Y
Schedule 1 (para 17) Letter from organisation providing domestic violence support services	N
Schedule 1 (para 18) Domestic violence support organisation - refusal of admission to a refuge	Y
Schedule 1 (para 19) Letter from public authority	Y
Schedule 1 (para 20) Leave to remain in the UK as a victim of Domestic Violence	N
Schedule 1 (para 21) Financial abuse	N

Figure 4 - The evidence schedule for Domestic Abuse.
(Evidence_Requirements_for_Private_Family_Law_Matters_guidance_version_10.pdf, no date)

alleges domestic abuse, domestic violence, sexual abuse against themselves or against child/ren.

Figure 4 shows the relevant evidence needed to obtain legal aid when allegations of domestic abuse are made. If such allegations are made, it is unlikely that software will resolve the issues between families and so those pathways will not be explored throughout this dissertation though it is worth noting such conflict and considering how to minimise it in technical capacities.

Other sections, such as Paragraph 10 (*Paragraph 10, Legal Aid, Sentencing and Punishment of Offenders Act 2012*, 2013) outline circumstances wherein an applicant may seek legal aid for urgent family matters; in the case of Paragraph 10 - to prevent child/ren from being unlawfully removed from

What are contact arrangements?

"Contact arrangements" is the name given to plans for when child/ren will have contact with specific people. It considers the time, place, duration and how frequent contact should take place and whether contact should be in-person or via other means.

the United Kingdom. In such cases, the child is considered "kidnapped" and so speedy legal action must be undertaken to ensure the welfare of the child.

In some cases, there may be no need for legal aid, such as where each party can afford legal representation at court; or the parties are able to resolve their differences amicably, perhaps by forming a parenting plan ('Parenting Plan', 2008) as per the recommendation by CAFCASS. Unfortunately, in cases where legal aid is required, such as those where families are in conflict over contact arrangements and cannot resolve the conflict themselves; perhaps because of "The Human Element" or some other factor; legal aid is rarely available.

Whilst legal aid is generally unavailable for 'contact' cases, there is another reason for legal aid being unavailable: financial ineligibility. Professor Hirsch of Loughborough University found that whilst the gross income rules for financial eligibility for legal aid would not necessarily "systematically deny" access to legal aid; "*the maximum level of disposable income at which legal aid is allowed, households have too little income to reach a minimum standard of living even before footing any legal bills. Typically, they have disposable incomes 10% to 30% too low to afford a minimum budget*" (Hirsch, 2018). This would mean that even if a party was awarded legal aid, they may fall into debt or below the poverty line owing to the contributory element resulting in proceedings being frustrated or eventually pointless owing to said party being unable to meet the child/ren's basic needs. Figure 5 shows such deficits.

Definitions: "Disposable income" as defined in Means Regulations; where "comparison to £733 limit" is a positive number, disposable income limit would exclude household from legal aid regardless of gross income. "Available income" is all income net of tax, rent and any child maintenance. "Available after MIS" shows difference between available income and Minimum Income Standard requirement. Red shows deficit. Calculations assume median private rent.

a) No children

	Disposable Income	Comparison to £733 limit	Available income	Available after MIS
Single	£1,491	£758	£1,486	£586
Couple, one earner	£1,259	£526	£1,486	-£12
Couple, dual earner	£1,488	£755	£1,760	£261

b) Couple with children:

(i) single earner

	Disposable Income	Comparison to £733 limit	Available income	Available after MIS
1 child	£ 1,081	£ 348	£ 1,599	-£ 130
2 children	£ 1,066	£ 333	£ 1,876	-£ 187
3 children	£ 984	£ 251	£ 2,086	-£ 512
4 children	£ 856	£ 123	£ 2,248	-£ 566

(ii) dual earner

	Disposable Income	Comparison to £733 limit	Available income	Available after MIS
1 child	£1,170	£437	£1,733	£4
2 children	£1,122	£389	£1,977	-£85
3 children	£1,102	£369	£2,248	-£349
4 children	£988	£255	£2,426	-£389

c) Lone parent

	Disposable Income	Comparison to £733 limit	Available income	Available after MIS
1 child	£1,123	£390	£1,460	£118
2 children	£1,066	£334	£1,694	£18
3 children	£1,046	£314	£1,967	-£203

d) Couple with children, single earner paying maximum child maintenance

	Disposable Income	Comparison to £733 limit	Available income	Available after MIS
1 child	£647	-£86	£1,165	-£564
2 children	£656	-£77	£1,466	-£597
3 children	£632	-£101	£1,733	-£864
4 children	£585	-£148	£1,978	-£837

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Figure 5 - Findings by Professor Hirsch showing disposable income for families following the MIS test. Category 'd', a common type of family unit in today's modern society shows the most deficit however would still be excluded from legal aid. (Hirsch, 2018)

The Joseph Rowntree Foundation claims of the MIS, used by Professor Hirsch for the above tests:

> "*Three in ten (29.9% or 19.6 million) of us are living below MIS, up from 26.8% (16.2 million) in 2008/09.*" (*Households below a Minimum Income Standard: 2008/09 - 2018/19*, 2021)
> - "*Children living with a lone parent are far more likely to be in a household below MIS than those living in couple-parent families: 67.7% of children in lone-parent households are*

growing up with inadequate income compared to 35.1% in couple-parent households." (*Households below a Minimum Income Standard: 2008/09 - 2018/19*, 2021)

- *"A quarter of all children in the UK in 2018/19 – 3.6 million – are living in households with incomes below 75% of MIS."* (*Households below a Minimum Income Standard: 2008/09 - 2018/19*, 2021)

In its review of LASPO, The Law Society concluded that "*large numbers of people, including children and those on low incomes, are now excluded from whole areas of free or subsidised legal advice – valuable advice which they cannot realistically be expected to afford themselves*." (Law Society)

In context of Family Conflict and symbiosis, LASPO is a major first hurdle to overcome as it means that persons who are in conflict must find resolution whilst in a state of Defection and emotional chaos without an objective outsider with an understanding of their legal position. Instead of using the court system, parties are legally obliged to seek out ADR (Alternate Dispute Resolution) however this is not guaranteed to resolve their issues and cannot be legally enforced.

2.2.2   The Children Act 1989

Enacted in 1991, The Children Act 1989 is the governing statute in respect to child matters and is split into two areas:

1. Private Law – Cases brought by individuals, for instance, to seek contact with their children. Courts can make various orders in private law cases, such as a Parental Responsibility Order, a Child Arrangements Order, a Prohibited Steps Order or a Specific Issue Order.
2. Public Law – Cases brought by the local authorities where authorities have significant concern over the welfare of child/ren.

It is worth noting the "Welfare Principle" (Oldham, 2016) from the Children Act 1989 which governs how courts must balance the needs of parties and the welfare of the child. The welfare principle is of relevance to Parentull owing to it being the default test against which to balance a child's welfare and the wants of parents.

In software development, a user case may arise where parties need to access their child/ren's information but are unable to gain access due to an ongoing dispute or court order; as a result; the user needs to be independently given access; however prior to granting access, the welfare test must be applied. The relevant parts of this principle can be seen in Appendix A and a visual representation can be seen in Figure 6.
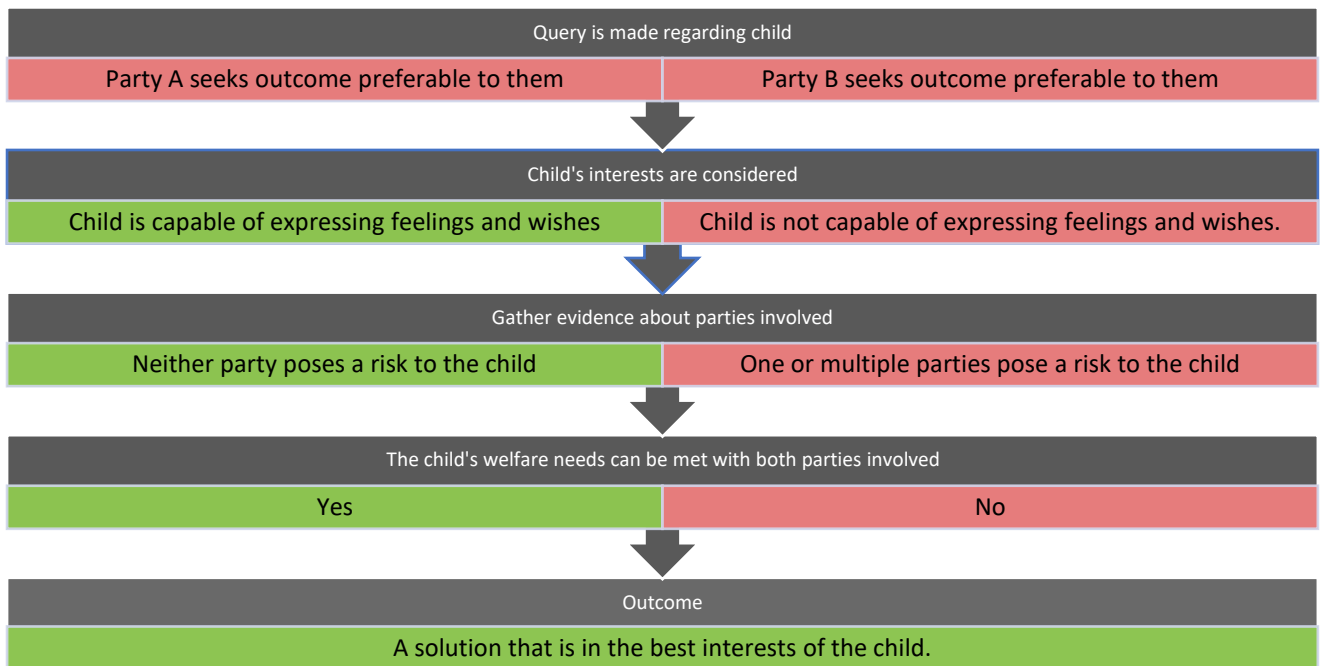
Query is made regarding child	
Party A seeks outcome preferable to them	Party B seeks outcome preferable to them

Child's interests are considered	
Child is capable of expressing feelings and wishes	Child is not capable of expressing feelings and wishes.

Gather evidence about parties involved	
Neither party poses a risk to the child	One or multiple parties pose a risk to the child

The child's welfare needs can be met with both parties involved	
Yes	No

Outcome
A solution that is in the best interests of the child.

Figure 6 - A visual representation of the welfare principle. Red indicates where the childs interests are not being considered or a risk is posed. Green highlights where the child's interests are being considered first.

2.2.3 Data Protection – DPA 2018/GDPR

The UK data protection regime is set out under DPA (Data Protection Act 2018) and UK GDPR. This legislation states that controllers (*Some basic concepts*, 2021) and processors (*Some basic concepts*, 2021), meaning; those who process information in an automated capacity should:

1. Minimise the amount of personal data held where possible through "Data Minimisation" (*Principle (c): Data minimisation*, 2021)
2. Identify a lawful basis for collecting and using personal data, ensuring that any collected data is not used in an unfair, misleading or unexpected capacity; finally provide details on how the data will be used in a clear, open and honest manner as per Article 5(1). The lawful basis list includes: Consent, Contract, Legal Obligation, Vital Interests, Public Task, Legitimate Interest, Special Category Data and Criminal Offence Data. (*Principle (a): Lawfulness, fairness and transparency*, 2021)
3. Be clear from the outset for the purpose of data collection and the use case for such data; comply with documentation and transparency obligations and ensure that if personal data will be disclosed in any additional or different purpose; that it is legal, fair and transparent as per Article 5(1)(b) (*Principle (b): Purpose limitation*, 2021)
4. Comply with Principle (e): Storage Limitation and setup a standard retention period for data and periodically review and delete data that cannot be justifiably kept. Data may be kept if it is within the public interest, is for scientific research or statistical purposes. (*Principle (e): Storage limitation*, 2021)
5. Ensure that data is secure as per Principle (f), this means that data should be encrypted and stored in a secure capacity. (*Principle (f): Integrity and confidentiality (security)*, 2020).

Controllers and Processors should also have regard to individual rights, which include:

1. Right to be informed – An individual has the right to be informed about the collection and use of their personal data. (*Right to be informed*, 2021)

2. Right of access – An individual has the right to access and receive a copy of their personal data and supplementary information. This most commonly happens via a Subject Access Request 'SAR' which can be made in any communicative format; including via a third party. (*Right of access*, 2021)
3. Right of Rectification – An individual has the right to have inaccurate personal data rectified; requests can be made orally or in writing and controllers/processors have one month to comply. (*Right to rectification*, 2021)
4. Right of Erasure – An individual has the right to request that their personal data is completely erased. (*Right to erasure*, 2021)
5. Right to restrict processing – An individual has the right to request restriction or suppression of their personal data. In essence, this means that data can be stored but not processed. (*Right to restrict processing*, 2021)
6. Right to data portability – An individual has the right to obtain and reuse their personal data for their own purposes across different services. In essence, this means that an individual is entitled to a copy of their information or to have it sent to another controller. (*Right to data portability*, 2021)
7. Right to object – An individual has the right to object to the processing of their personal data at any time. Objections can be in relation to some or all personal data and responses must be given within one calendar month. (*Right to object*, 2021)

2.2.4 BCS Code of Conduct

Further to legal requirements, the BCS has a code of conduct which comprises of four key principles that all members should keep in mind. These principles are:

1. Public Interest
    a. You shall have due regard for public health, privacy, security and wellbeing of others and the environment.
    b. You shall have due regard for the legitimate rights of third parties.
    c. You shall conduct your professional activities without discrimination on the grounds of sex, sexual orientation, marital status, nationality, colour, race, ethnic origin, religion, age or disability, or any other condition or requirement.
    d. You shall promote equal access to the benefit of IT and seek to promote the inclusion of all sectors in society wherever opportunities arise.
2. Professional Competence and Integrity
    a. You shall only undertake to do work or provide a service that is within your professional competence.
    b. You shall not claim any level of competence that you do not possess.
    c. You shall develop your professional knowledge, skills and competence on a continuing basis, maintaining awareness of technological developments, procedures and standards that are relevant to your field.
    d. You shall ensure that you have the knowledge and understanding of legislation and that you comply with such legislation, in carrying out your professional responsibilities.
    e. You shall respect and value alternative viewpoints and seek, accept and offer honest criticisms of work.
    f. You shall avoid injuring others, their property, reputation or employment by false or malicious or negligent action or inaction.

g. You shall reject and will not make any offer of bribery or unethical inducement.
3. Duty to Relevant Authority
    a. You shall carry out professional responsibilities with due care and diligence in accordance with the relevant authority's requirements while exercising your professional judgement at all times.
    b. You shall seek to avoid any situation that may give rise to a conflict of interest between you and your relevant authority.
    c. You shall accept professional responsibility for your work and for the work of colleagues who are defined in a given context as working under your supervision.
    d. You shall not disclose or authorise to be disclosed, or use for personal gain or to benefit a third party, confidential information except with the permission of your relevant authority, or as required by legislation.
    e. You shall not misrepresent or withhold information on the performance of products, systems or services (unless lawfully bound by a duty of confidentiality not to disclose such information), or take advantage of the lack of relevant knowledge or inexperience of others.
4. Duty to the profession
    a. You shall accept your personal duty to uphold the reputation of the profession and not take any action which could bring the profession into disrepute.
    b. You shall seek to improve the professional standards through participation in their development, use and enforcement.
    c. You shall uphold the reputation and good standing of BCS, The Chartered Institute for IT.
    d. You shall act with integrity and respect in your professional relationships with all members of BCS and with members of other professions with whom you work in a professional capacity.
    e. You shall encourage and support fellow members in their professional development.

2.3 Existing Products

Moving now to look at existing software solutions processing the same or similar types of data in relation to families/children.

2.3.1 OurHome

A family management app available on iOS, Android and via a web app which are built on React Native (*React Native · Learn once, write anywhere*, no date) a javascript framework released by Facebook in 2015. Evidence can be seen in Figure 7 and Figure 8.

```
▼ <head>
    <style id="react-native-modality">:focus { outline: none; }</style>
  ▼ <style id="react-native-stylesheet-static">
      html{font-family:sans-serif;-ms-text-size-adjust:100%;-webkit-text-size-adjust:100%;-
      webkit-tap-highlight-color:rgba(0,0,0,0);} body{margin:0;} button::-moz-focus-
      inner,input::-moz-focus-inner{border:0;padding:0;} input::-webkit-inner-spin-
      button,input::-webkit-outer-spin-button,input::-webkit-search-cancel-button,input::-
      webkit-search-decoration,input::-webkit-search-results-button,input::-webkit-search-
      results-decoration{display:none;} @keyframes rn-ActivityIndicator-animation{0%{-webkit-
      transform:rotate(0deg);transform:rotate(0deg);}100%{-webkit-
      transform:rotate(360deg);transform:rotate(360deg);}} @keyframes rn-ProgressBar-
      animation{0%{-webkit-transform:translateX(-100%);transform:translateX(-100%);}100%
      {-webkit-transform:translateX(400%);transform:translateX(400%);}} .rn-105ug2t{pointer-
      events:auto !important;} .rn-ah5dr5{pointer-events:auto !important;} .rn-633pao{pointer-
      events:none !important;} .rn-12vffkv{pointer-events:none !important;} .rn-12vffkv >
      *{pointer-events:auto;} .rn-ah5dr5 > *{pointer-events:none;}
    </style>
  ▼ <style id="react-native-stylesheet">
    </style>
```

Figure 7 - Head code from Ourhomeapp.com showing react-native stylesheets

```
  ▼ <script type="text/javascript">
      window['__ourhome'] = window['__ourhome'] || {}; window['__ourhome'].config = { apiRoot:
      'https://api.ourhomeapp.com/api', apiVersion: '1', apiClientId: 'c34458544f05f5d00aba',
      gcmAppId: '1098006315058', appName: 'OurHome', appVersion: '3.13.1' }; /* This function
      has to be global to handle app open via custom url scheme */ window.handleOpenURL =
      function handleOpenURL(url) { var appRoute = (url || '') .replace(/^[^s]*\:\/\//,
      '').trim() .replace(/^[\/]*/, '') .replace(/[\/]*$/, ''); if (appRoute.length) {
      setTimeout(function () { window.location.hash = '#' + appRoute; }, 0); } };
    </script>
    <script type="text/javascript" src="app.js"></script>
</body>
```

Figure 8 - Script code from Ourhomeapp.com showing react native code and references to 'app.js' the core app file in any reactive native application.

Our Home was initially unavailable owing to the lack of standardised https connections, however once this was resolved, presented an onboarding screen as seen in Figure 9.
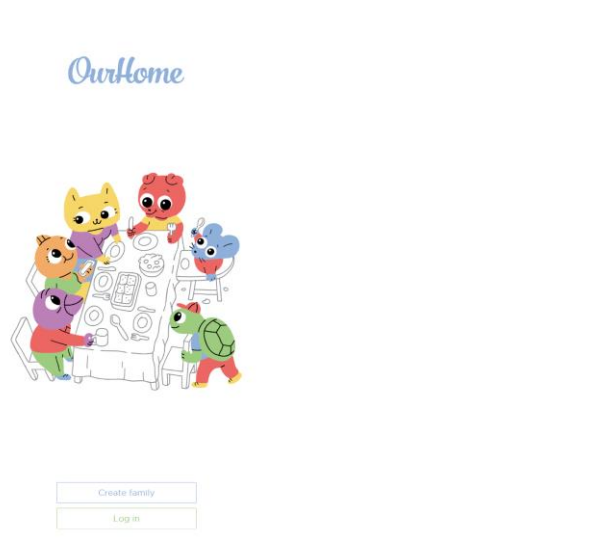
Figure 9 - Our Home onboarding screen available at: https://app.ourhomeapp.com/#onboarding/welcome

Further into the onboarding process, OurHome asks for a family name and password stating that all family members will use this password. Such account management is similar to how Netflix, a video steaming service, utilises one email and password for a lead account holder who can then give access to sub-profiles. Having a main account holder may work for families who are not in conflict, however, there are questions to be raised regards such a method working with those outlined in Parentull's User Stories (Appendix B). In particular, Scott Dudley's (7.3.3) story involves authority intervention which would disallow Scott Dudley's information from being disclosed in such a capacity. Likewise, a significant number of the user stories involve requesting information from third party processors which it would be unwise to expose to children's accounts.

More positively, The minimisation of information requested by OurHome about users goes some way to comply with international legislation, including that set out by the EU and UK but also the USA in respect to child online protection. OurHome has also included Parental consent to opt-in a child to the apps services prior to delivering an array of features which encourage organisation such as points, shopping lists, calendar and messaging.

2.3.2 Family Wall

A family management application available on iOS, Android and Web. It appears the primary languages for Family Wall Web are HTML, CSS, JS and PHP with a Firebase backend integration.

The main difference to OurHome, programming language and backend infrastructure aside, is that Family Wall processes much more personal information, for example, Family Wall includes Timetables, Messages, a gallery, Contact book, Map in its free version as well as External Calendar Syncing, Real-Time Location tracking, Safe Zone Notifications and Audio/Video messages in its 'Premium' version.

Family Wall allows one account holder to create multiple family groups. It is unclear whether the collection of this information is intentional, however, creation of multiple family groups creates implied relationships, for example, where a parent has children with a partner from a previous relationship. This information could then be used to target the subset of users with such relationships.

Having tested the map feature trying to add the location for Clough Road Police Station, it appears that there is a bug on the web version which adds locations by default to a San Francisco address even when the required address is supplied/location name is supplied. Figure 10 shows the location having been added to the map. Figure 11 shows a pop up from Google maps indicating that the map could not load properly, this may suggest that the bug is related to the implementation of the Google maps API. Having checked the inspector console, the API theory appears to be confirmed owing to errors as seen in Figure 12.
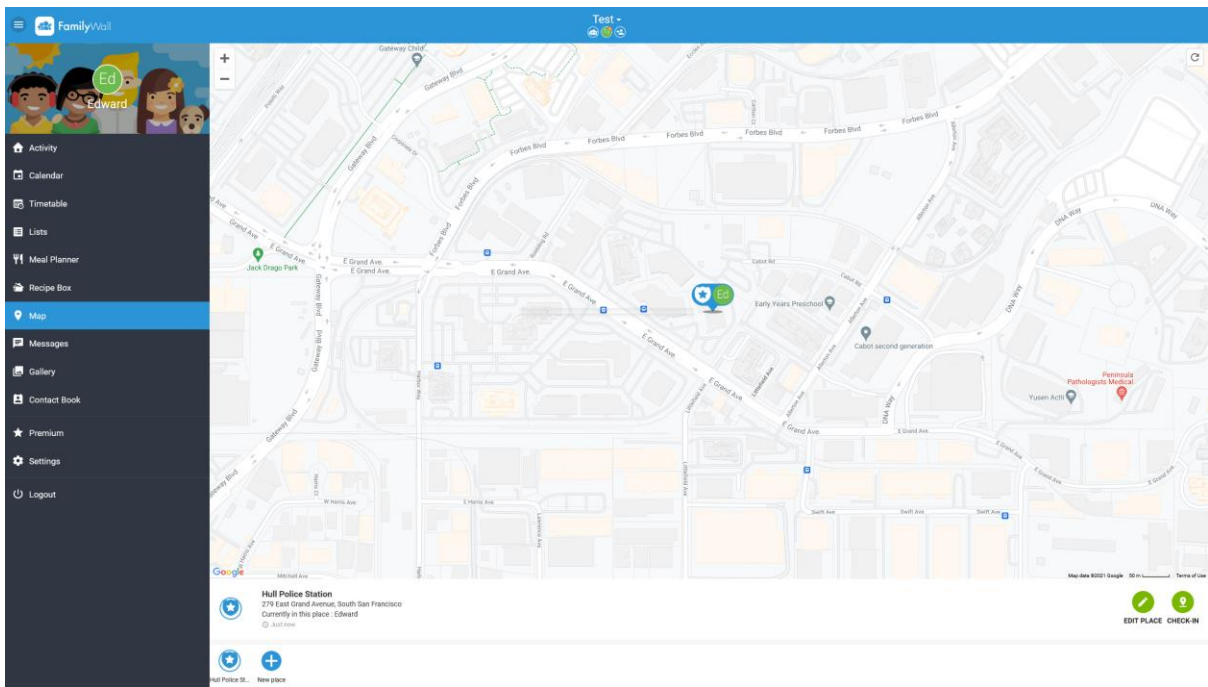
Figure 10 - Bug in Family Wall map location when adding the address for Clough Road police station, the address defaulted to 279 East Grand Parade in San Franciso
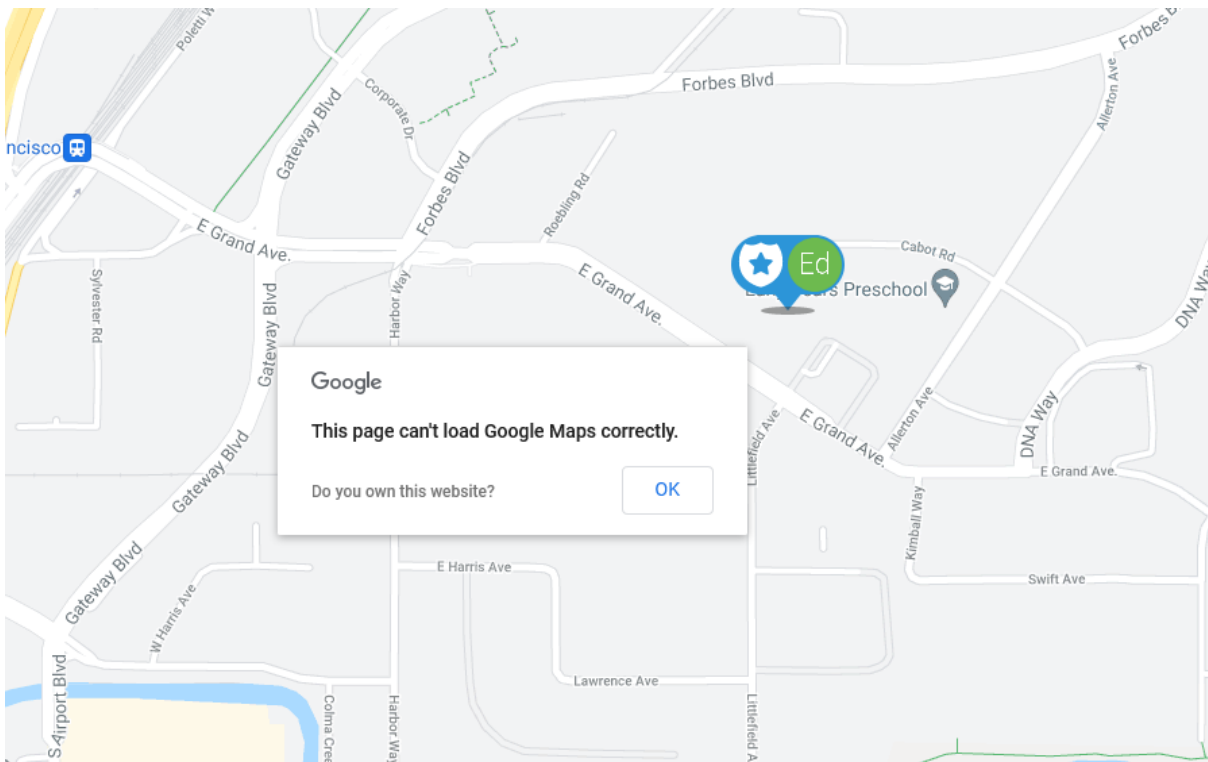

Figure 11 - Pop-up from Google showing that google maps couldn't load properly.

```
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
⚠ Cookie "" has been rejected as third-party.                                                                          AutocompletionService.GetPredictions
⊗ ▶ This API key is not authorized to use this service or API. Places API error: ApiTargetBlockedMapError              js:88:128
     https://developers.google.com/maps/documentation/javascript/error-messages#api-target-blocked-map-error
```

Figure 12 - Authorisation errors in relation to the map for Family Wall

2.3.3   Community Brands

Community Brands is an American business group with subsidiary software solutions providers in multiple countries around the world. Software provided by Community Brands are aimed specifically at communities such as schools, churches, families and charities. The parent company has around 2000 employees serving over 100,000 clients in 30 countries. Whilst it is beyond the scope of this project to analyse each and every solution Community Brands and subsidiaries offer in detail, it is worth noting references to the solutions and the types of data processed.

For brevity, this information can be found in Appendix C.

2.3.4   Wonde

A final existing product worth mentioning is Wonde, which do not directly implement an app however provide the ability for other data processors, for example, app developers, to use an API in order to interact as a third party with school information. There is a huge amount of information available via the API such as attendance, assessment information, contacts, doctor and medical information, photos and behaviour information. (*Wonde - API Reference*, no date)

It is worth mentioning Wonde as such information has in the past been restricted to SIS providers, such as those mentioned under the Community Brands umbrella; however such APIs could enable single or small teams of developers to deliver more innovative software solutions to families, schools and other authorities, such as safeguarding, police, care and medical authorities as well as courts.

2.4   Software Development

In relation to software development and the aforementioned existing products, there are several elements of software that should be considered.

2.4.1 Databases

Cornelia and fellow authors write an interesting comparison between MongoDB, a form of non-relational database and traditional MySQL, or relational databases offering comparative results of INSERT and SELECT operations performed between 1 and 50,000 queries; as seen in Figure 12.

Whilst NoSQL performs better on average, the select operation at 50,000 users reveals that traditional SQL databases return queries much faster. NoSQL also allows more flexibility in terms of structure and handle large amounts of data comparatively better than relational databases; however at the time of publication of Cornelia's comparison, NoSQL lacked standardisation or security methods. Significant work has been undertaken to standardise NoSQL. Such efforts can be seen in Amazon Aurora and Microsoft Cosmos DB. Standardisation of NoSQL has progressed so much that Entity Framework has NuGet packages to integrate directly with Azure Cosmos DB (AndriySvyryd, no date); though it could still be said that traditional relational databases remain the 'go to' for production services.

INSERT operation:

Insert	MongoDB - sec	SQL - sec
1 user	00:00:00:003	00:00:00:402
100 users	00:00:00:005	00:00:00:096
500 users	00:00:00:018	00:00:00:183
1.000 users	00:00:00:033	00:00:00:387
5.000 users	00:00:00:162	00:00:00:736
10.000 users	00:00:00:521	00:00:01:085
25.000 users	00:00:00:816	00:00:03:378
50.000 users	00:00:01:835	00:00:08:306

SELECT operation:

Select	MongoDB - sec	SQL - sec
1 user	00:00:00:003	00:00:00:083
100 users	00:00:00:004	00:00:00:002
500 users	00:00:00:017	00:00:00:005
1.000 users	00:00:00:031	00:00:00:006
5.000 users	00:00:00:206	00:00:00:028
10.000 users	00:00:00:291	00:00:00:052
25.000 users	00:00:00:830	00:00:00:190
50.000 users	00:00:01:616	00:00:00:327

Table 3.1 – Insert operation results
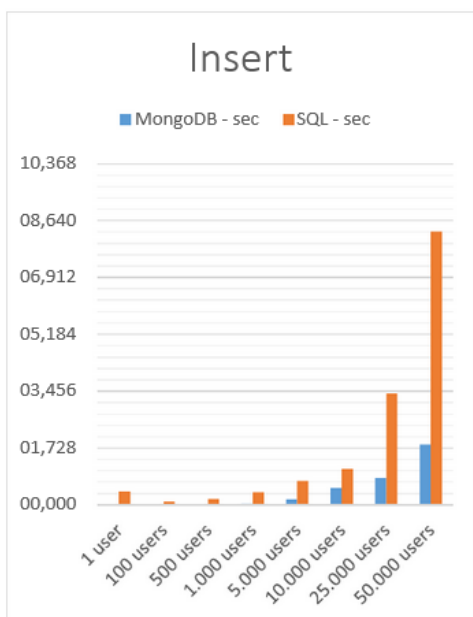
Table 3.2 – Select operation results
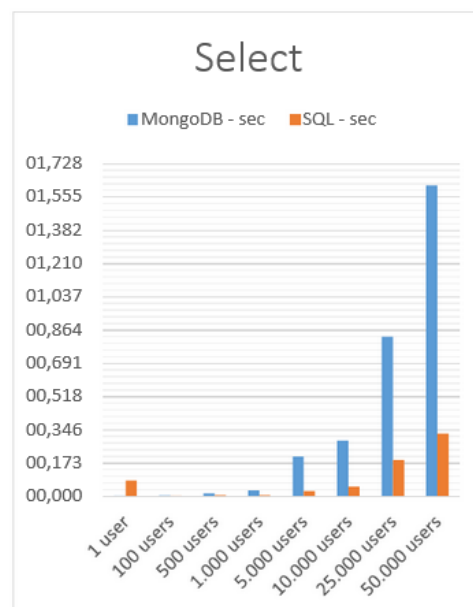
Figure 13 - Comparison between non-relational and relational database operations (Győrödi et al., 2015)

2.4.2   REST/SOAP

REST (*What is REST*, no date), proposed by Fielding (*Fielding Dissertation: CHAPTER 5: Representational State Transfer (REST)*, no date) and SOAP are both methods of transmitting and receiving information. REST provides an architecture between computer systems; a contract for how to communicate and is most used to create APIs relying on HTTP verbs to perform the relevant action. In comparison, SOAP is a protocol and relies on XML and remote procedure calling. Redhat give an excellent overview of the differences between REST and SOAP (*REST vs. SOAP*, no date)

2.4.3   Object-relational mapping (ORM)

ORM is a programming technique which allows programmers to focus on data management and functionality of their respective program instead of creating and maintaining the database. ORM automates the creation of the database by mapping objects to database tables. Lorenz (Lorenz *et al.*, no date) explores this subject in further detail revealing issues such as lack of fine grain control over databases and their models; suggesting alternatives to ORM designs.

Entity Framework is an example of ORM. (Rick-Anderson, no date)

2.4.4   Code Versioning

Spandel (Spandel and Kjellgren, no date) outlines the differences between Git (decentralised) and Subversion (centralised), which at the point of publication – 2014 – were the most popular version control systems. 7 years later, it could be argued that Git has won the version control war and is most widely adopted. Version control is essential to software development for tracking changes, bugs, issues and collaboration. Spandel concludes that use of version control encourages developers to create more checkpoints detailing changes as opposed to those working on alternative systems.

3   Requirements

In this section, requirements for the software shall be considered with respect to project aims and objectives, User Stories in Appendix B, available tooling and regulatory guidelines as detailed in Section 2.2.

3.1   Changes since PID

Since the PID, there have been several changes to the project which should be noted for consideration. These are listed below:

3.1.1   Transfer from Xamarin to Blazor

On submission of the PID, one of the primary objectives was to create an Android version of Parentull. This objective was demoted to a secondary objective despite some work having been carried out on the "*White Mocha*" version of Parentull; "*White Mocha*" being the code name allocated to the alpha branch pertaining to the development of the Android app using Xamarin and CosmosDB.

Figure 14 A screenshot of commits made to the WhiteMocha branch of Parentull

In total, 42 commits were made on the Alpha branch of WhiteMocha, shown in Figure 14, resulting in a working application which made successful connections to Azure CosmosDb retrieving and updating database information as can be seen in Figures 15 and 16.

Despite this, it was felt necessary to halt development of White Mocha and switch to a newly established "Cortado" branch focusing on a Blazor web application owing to developments discovered in the upcoming .NET Maui release where Blazor will receive support for cross platform applications. Microsoft state on their devblogs "*You can now host Blazor components in .NET MAUI apps to build cross-platform native apps using web UI* [.....] *Your components can access native functionality through the .NET platform, and they render standard web UI. .NET MAUI Blazor apps can run anywhere .NET MAUI can (Windows, Mac, iOS, and Android) although our primary focus for .NET 6 is on desktop scenarios*." (*ASP.NET Core updates in .NET 6 Preview 4*, 2021) Given this new information, it seemed appropriate to focus on building a Blazor application which could then be extended to include functionality for other services at a later date whilst also meeting other primary objectives.

Figure 15 WhiteMocha running retrieving items from CosmosDb

3.1.2   Transfer from NoSQL to MySQL

Following submission of the PID, it was decided to use NoSQL as the database system for Parentull given the flexibility of NoSQL to change schema and form relationships between database entities compared to MySQL databases. Furthermore, from the authors perspective, it was an exciting opportunity to learn more about implementing a NoSQL

Figure 16 CosmosDb Entry in the Azure Portal

Databases; however on consideration of the implications of compliance with GDPR and other legal and professional obligations; it was decided that working with database schema and systems which are most commonly used, administered and easily integrated to existing infrastructure would contribute further to the projects success; therefore the project switched to MySQL.

3.1.3   Revocation of API requirement.

As part of White Mocha, it was suggested to deploy a network on Azure utilising the API Manager service in order to create integration with the Cosmos DB database for CRUD operations which could be called from the application. The suggested CRUD operations were as listed in Figure 17.
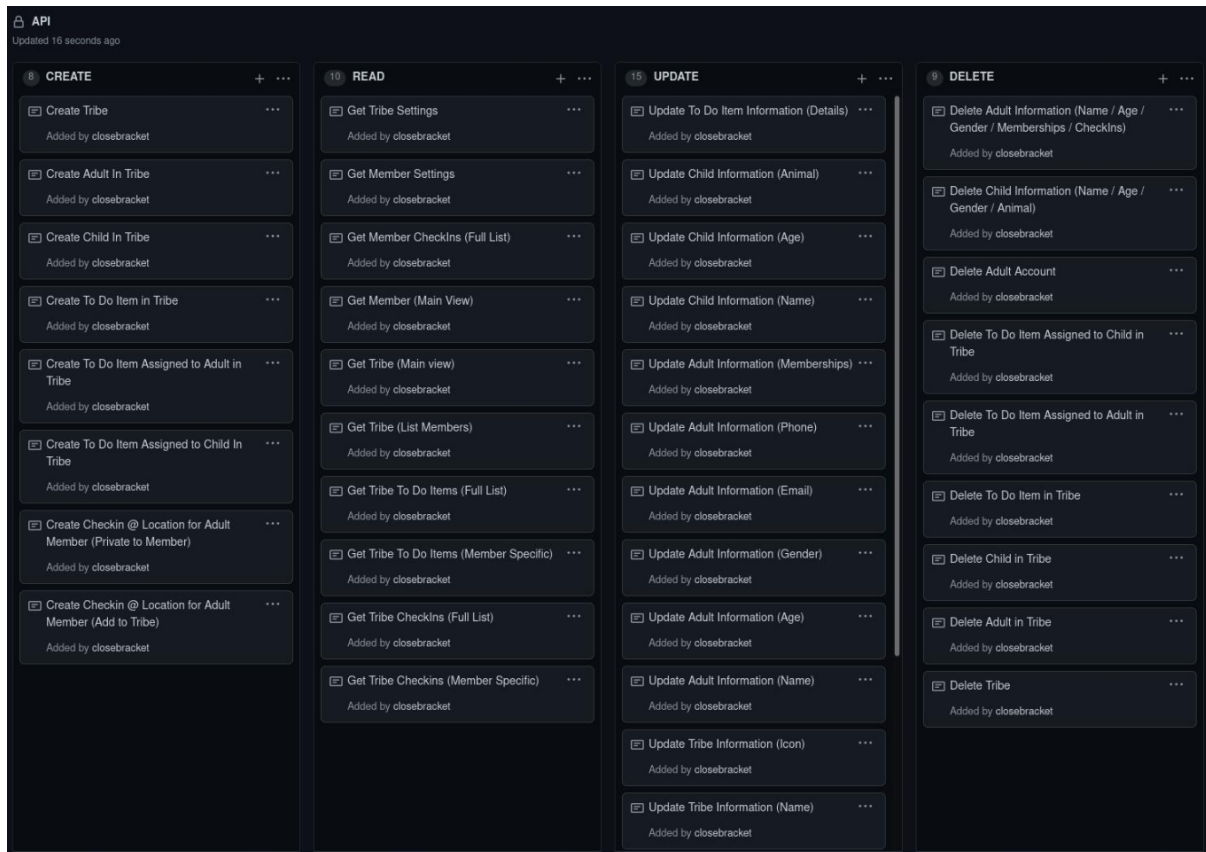
Figure 17 - CRUD operations proposed for the API

The proposed network architecture for Azure listed in Figure 18.
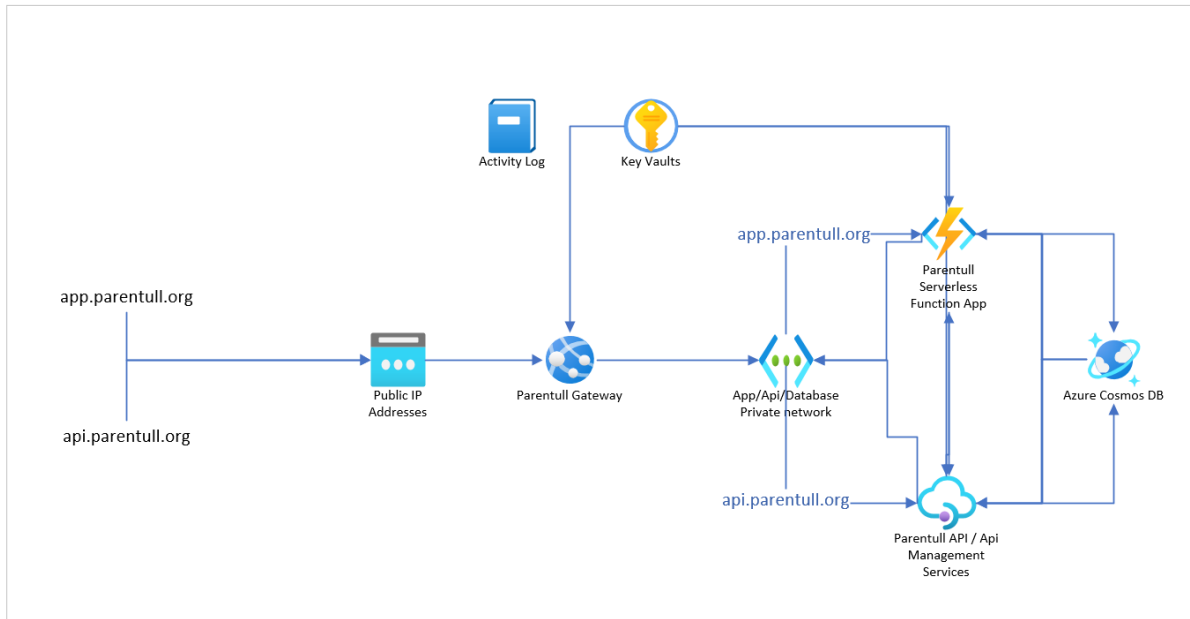
Figure 18 - Proposed Network architecture for the API and Application

This network architecture used a public IP address attached to an application gateway to direct traffic to its intended destination on an internal network. The Serverless Function App, API and Cosmos Db work together to serve information based on requests received. Key vaults hold SSL certificates and other authentication/authorisation roles.

On reflection, this level of infrastructure was thought to be to an over implementation for this project which simply requires a proof of concept and therefore the API Requirement was revoked. It should be noted however that such a network, where measures have been taken to layer access and protect the database would be a key consideration for a production environment.

3.2   Technical Considerations

3.2.1   Database Technology

As explored in the Literature review, Section 2.4.1, there are two main database types available: MySQL and NoSQL.

NoSQL databases were given due consideration and tested as outlined in section 3.1, subsection 3.1.1. During this consideration, Azure CosmosDb was selected for use on Azures Free Tier for evaluation and the test could be considered successful as NoSQL was able to store and send back the relevant information. NoSQL is also capable of processing large quantities of data and such databases are implemented to handle, arguably, the largest datasets in the world at companies such as Google, Microsoft, Facebook and Linkedin (Foote, 2018). Ultimately, however selecting a NoSQL database did not seem to be the most appropriate given the high cost of queries on Azure Cosmos Db compared to MySQL which could be utilised locally during development. Another consideration was that selecting MySQL would not have resulted in a loss in speed as per section 2.4.1 yet still allowed for data to be migrated to NoSQL database in the future, were Parentull to scale beyond the test dataset.

3.2.2 Cross-Platform Development Environment

In consideration of a cross-platform development environment, four options were considered, these options were Xamarin, React Native, Blazor and Flutter. Each was considered based on the authors familiarity with the platform, maturity level and positives and negatives of use as can be seen in Table 1.

All environments had good documentation offered by the environment maintainer and communities. There were active communities on Github for each environment. At the time of writing, Xamarin had 3,383 public repositories including starter and example projects (Figure 19); React Native had significantly more public repositories with 26,212 (Figure 20); Blazor had the least public repositories with 1,739 although there was some segregation between the Blazor WASM, Blazor Server and Generic 'Blazor' topic (Figure 21); finally, Flutter had an admirable 23,112 public repositories (Figure 22).

Flutter and Blazor are the least mature of the environments yet have comparably the most extensive platform support and feature set. For instance, both Flutter and Blazor support web markup languages such as HTML and allow CSS for styling; in comparison Xamarin relies on XAML. It could be argued that opting to use XAML over HTML, despite both being markup languages, would incur technical debt owing to how widely supported HTML and CSS are compared to XAML; this is supported by wider adoption of HTML/CSS as the default choice of language for modern cross platform development.

Considering the author had low familiarity of Flutter and React Native, and that consideration needed to be paid to user stories

As was mentioned in Section 3.1, Subsection 3.1.1, initial work was done with Xamarin however subsequent announcements regarding the

Figure 19 – Xamarin Public Repository Count
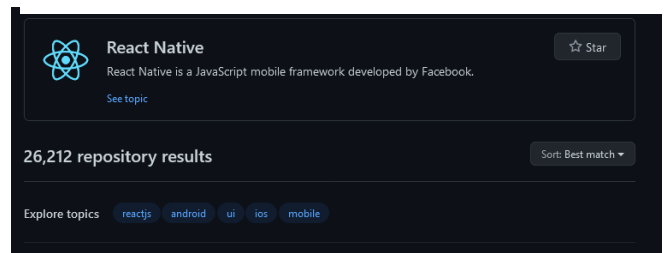
Figure 21 – React Native Public Repository Count
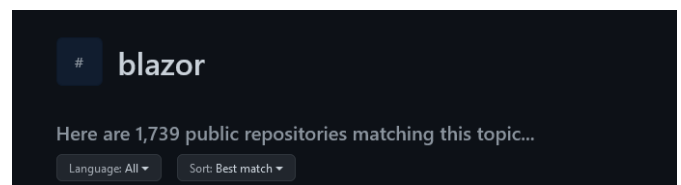
Figure 20 – Blazor Public Repository Count
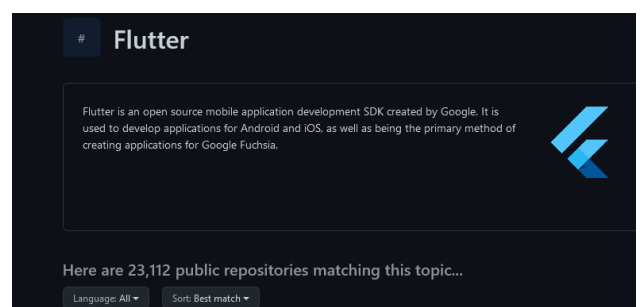
Figure 22 – Flutter Public Repository Count

development of cross-platform compatibility of Blazor, dubbed "Blazor Hybrid", which will feature native applications for Android, iOS and Desktop; Blazor was the most appropriate choice given its support and integration of common web languages / interfaces; easy integration with Microsoft services and native integration with ORMs such as Entity Framework despite it being the application with the least public repositories on platforms such as github.

Platform	Language(s)	Familiarity	Maturity	Positives	Negatives
Xamarin	F#/C#	Medium	Mature. Released in 2011 by Microsoft.	Xamarin is well documented and has a strong community. Native device / library support	Heavier platform with fractured third party support for all android and iOS libraries. Outdated markup languages Slower development time
React Native	Javascript	Low	Fairly mature, Released 2015 at F8 Conference.	Easy code reuse Has a strong community with plenty of documentation.	Lacking android support Slower development time
Blazor	C#	Medium	Not Mature. Released in 2018 by Microsoft.	Well documented with strong community. Native device/app support coming in MAUI. Utilises web languages, reduces development time and costs.	Still in the first few years of release. Does not currently support native device apps, substitute is PWA.
Flutter	Dart	Low	Not mature, released 2018, Google I/O	Flutter 2 will enable one codebase for iOS, Android, Windows, MacOS and Linux applications. Supports PWAs	Uncommon native libraries are not supported. Slower development time

Table 1 - Comparison between cross-platform development environments.

3.2.3   Professional Use Cases

It is important to note professional use cases not in scope for Parentull but which were considered for during technical considerations when selecting frameworks and environments. Due consideration was given to technology in use by local authorities and the ecosystems which they utilise on a day to day basis. The Police Digital Summit (*Police Digital Summit 2021 - Sold Out!*, no date) was of interest listing several speakers covering Microsoft technologies, including Microsoft 365 and Azure. Similarly, TuServ (*Home | tuServ*, no date) is a windows and android application offered by Black Marble which integrates with other Microsoft technologies serving police forces.

3.3   Functional requirements

The following functional requirements give regard to the basic expectation of the systems behaviour and must be implemented to enable users to achieve their goals as well as meet objectives.

Primary Objectives

Requirement Number	Requirement	Description	Dependencies
01	Application should have a web interface that users can access	Application should present a web interface which users can access.	N/A
02	Application can retrieve and store information from a database.	Application should connect to a database to retrieve or store information as per user queries.	N/A
03	Application should allow users to register.	Users should be able to register for the application using an email and password.	01, 02
04	Application should allow users to login.	Users should be able to login to their account using the email and password used during registration.	01, 02, 03
05	Application should allow users to manage their personal information to comply with GDPR.	Users should be able to update their personal information, such as email, password and other information processed by the application.	01, 02, 03, 04
05.1		Users should be able to download a copy of their information from the application.	01, 02, 03, 04
05.2	Application should allow users to	Users should be able to enable two-factor	01, 02, 03, 04

	enable two factor authentication	authentication to require additional authentication when logging into their account. This should be available be a string or QR code.	
06	Application should allow users to create various object types available within the application	Registered users should be able to input data and push a button to create objects such as circles, children, events, medication, rules and tasks.	01, 02, 03, 04
07	Application should allow users to delete various object types available within the application.	Registered users should be able to delete data via pushing a button.	01, 02, 03, 04
08	Application should allow users to edit various object types available within the application	Registered users should be able to update information within objects and save the information by pushing a button.	01, 02, 03, 04
09	Application should retrieve and present information by a unique identifier	Users should be able to request information by a unique identifier and be presented with the relevant information.	01, 02, 03, 04

3.3.1   User Interfaces

This section will focus on user interfaces considered as part of the development process for Parentull. User Interfaces provide a means for the user to communicate with the system and understand information presented by the system. These interactions translate into input / output scenarios where the user offers input to the system and receives some form of output.

On submission to the University of Hull big idea competition in 2019, the author proposed several user interfaces for Parentull which was under very early formulation as an idea. Figure 23 shows the initial user interface proposed detailing lots of information about the users child, Sarah, including upcoming events and a stream of activity. It allows the user to press a button to pay for a school trip and access other areas of the application. Figure 24 in comparison improves on the interface by removing text-based information so that it is less cluttered and offering more options; notably the option to ask members of the 'tribe' (meaning family) to contribute towards the school trip. Figure 25 showing the final draft of the interfaces again reduces text-based clutter opting for iconography and colour based recognition; on the first interface, it can noted that awards, education, health and finance dashboards can be accessed through a 'tile' which can be tapped / clicked. This interface is also the 'main view' for a parent wherein tapping/clicking on a child would take them to the second view as depicted.

Figure 26 proposed an interface which would allow users in conflict to communicate. The original idea for this interface was to allow users who were the alleged or proven victims of domestic abuse/violence to retain communications with abusers who had been awarded contact with their children. This situation does arise and is frequently campaigned against by women's rights organisations however as mentioned in Section 2, subsection 2.2.2, the welfare of the child is the paramount consideration of the court.

The vision for the interface was to allow specific data input, such as who wanted to have contact with whom along with dates, times and a location. Responding, only a Boolean option could be returned; that is to say, yes or no. If yes were returned, the proposed event would be added to a shared calendar; however, if no were returned, the user declining would be given the option to propose another date, time, location. As far as research shows, no such interface or system exists to date in the United Kingdom because the modus operandi is to separate individuals and direct to court instead of encouraging such communication.
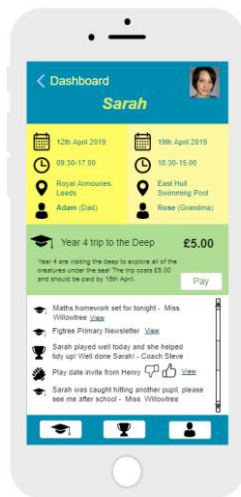
Figure 23 - First iteration of a proposed mobile application user interface for Parentull.
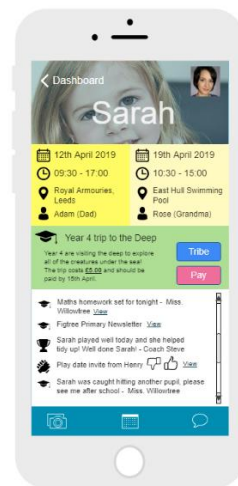
Figure 24 - Improved user interface for a mobile application for Parentull.
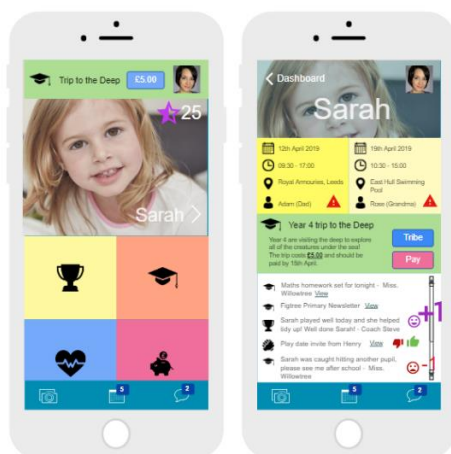
Figure 25 - Final draft of the proposed mobile application user interfaces for Parentull.
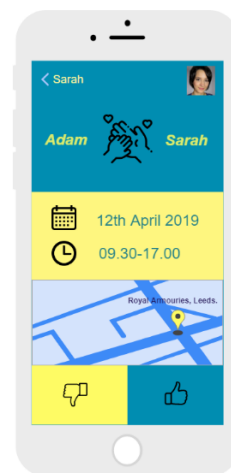
Figure 26 - A proposed interface which would allow users in conflict to communicate.

In terms of the Blazor Application written for Parentull, Figures 27-33 show interfaces created to allow for data 'input' by a user. Each interface shows only the information relevant to the object being created and meets Functional Requirement 01, 02 & 06. Similarly, Figures 34 -40 were created to allow users to view information in the database fulfilling functional requirements 01 and 02. In considering the CRUD methodology and determining Blazors capabilities, it was determined that a separate interface was not required to comply with functional requirement 07. Functional Requirement 07 is fulfilled via the 'Delete' button accompanying each item listed on the interface. At the time of writing, Update interfaces were not implemented.

3.3.1.1   CREATE interfaces
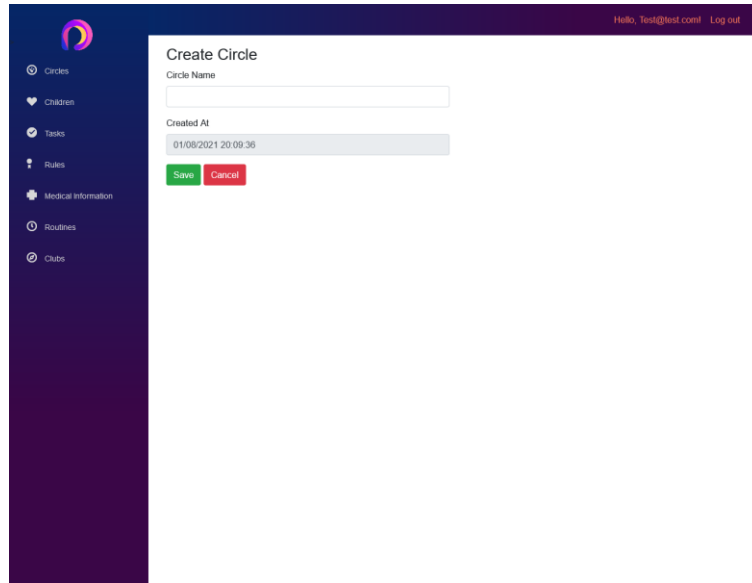
Figure 27 - Create interface for Circles. Note that it allows for data input relevant only to the object.
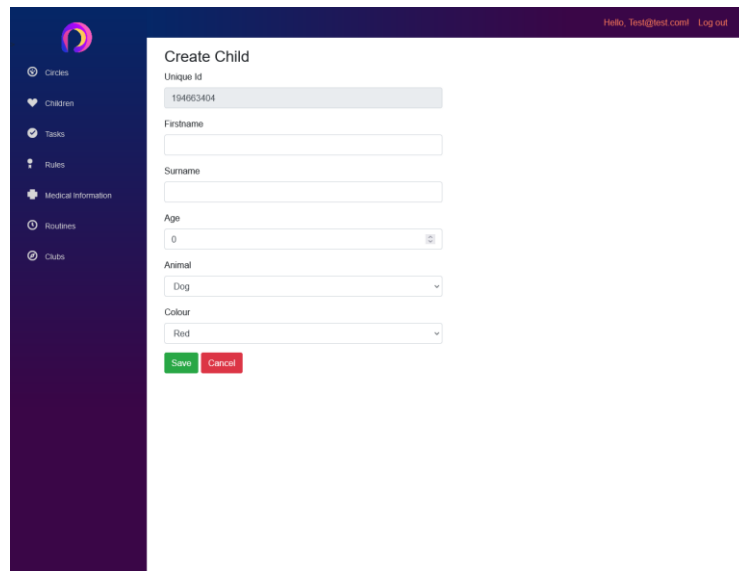
Figure 28 - Create interface for Children. Note that it allows for data input relevant only to the object.

Figure 29 - Create interface for Tasks. Note that it allows for data input relevant only to the object.

Figure 30 - Create interface for Rules. Note that it allows for data input relevant only to the object.

Figure 31 - Create interface for Medicine. Note that it allows for data input relevant only to the object.
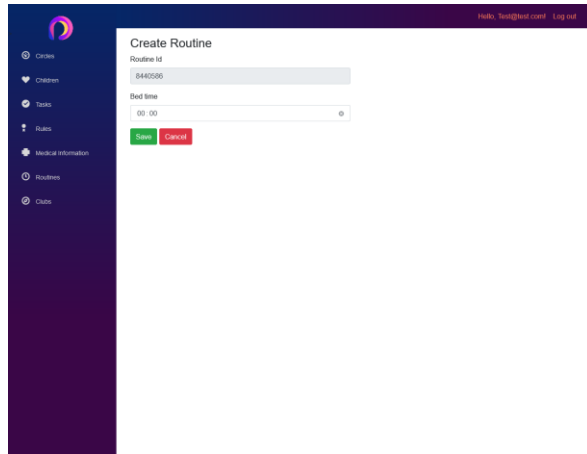
Figure 32 - Create interface for Routine. Note that it allows for data input relevant only to the object.
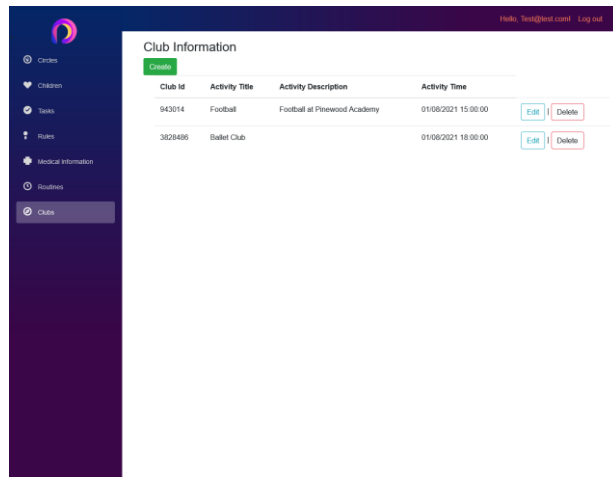
Figure 33 - Create interface for Clubs. Note that it allows for data input relevant only to the object.

3.3.1.2   READ Interfaces
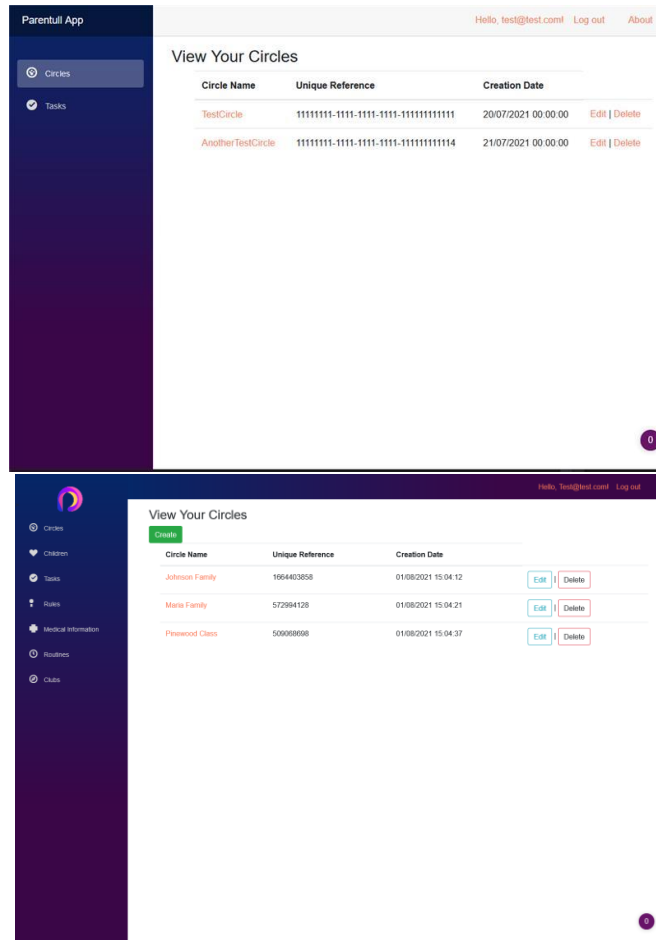
Figure 34 - TOP – The initial interface for 'Viewing' circles. This is the default Blazor view. BOTTOM: Customised view with improved interface and controls.
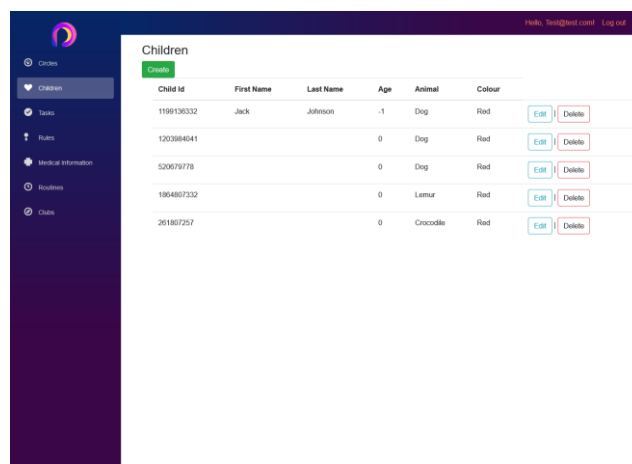
Figure 35 - The read interface for 'Children' showing a list of created children. Note the delete button, whereupon pressing the object would be deleted. Thus removing the requirement for a separate interface.
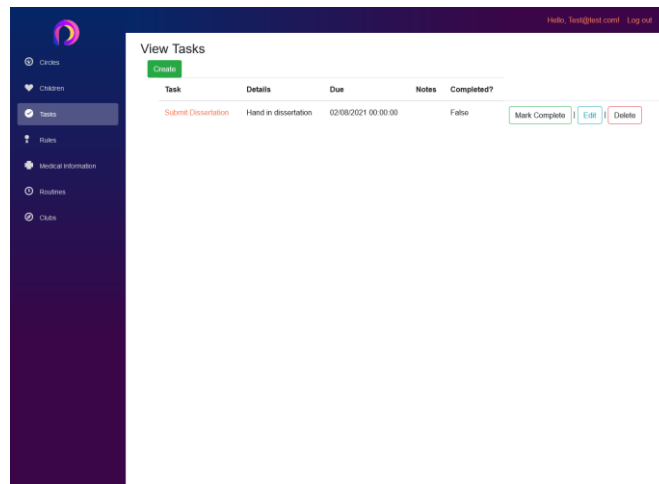
Figure 36 - The read interface for 'Tasks' showing a list of created tasks. Note the delete button, whereupon pressing the object would be deleted. Thus removing the requirement for a separate interface.
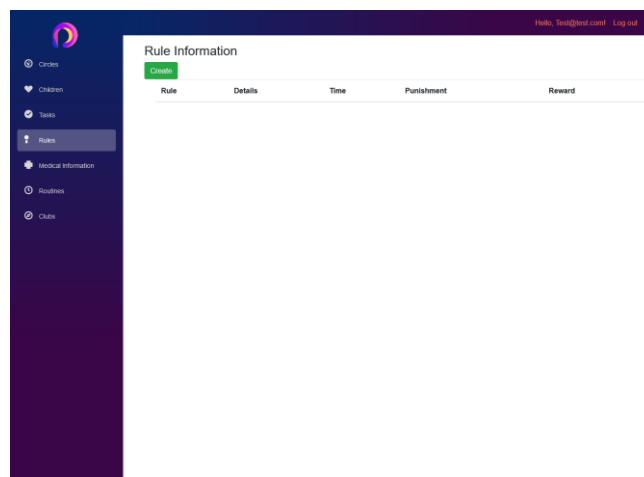
Figure 37 - The read interface for 'Rules' showing a list of created Rule. Note that this interface lists no entries.
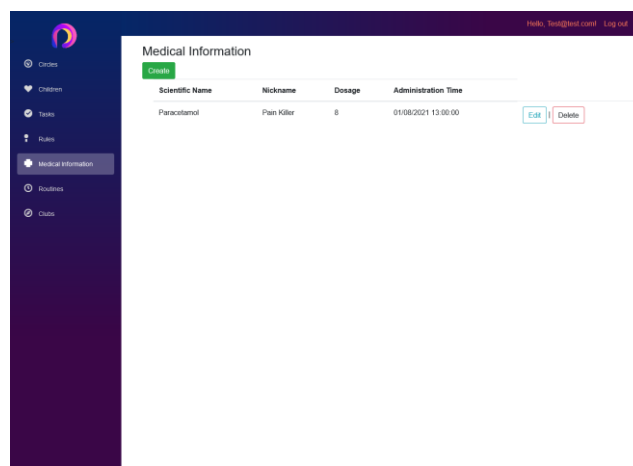
Figure 38 - The read interface for 'Medical Information' showing a list of created medical information. Note the delete button, whereupon pressing the object would be deleted. Thus removing the requirement for a separate interface.
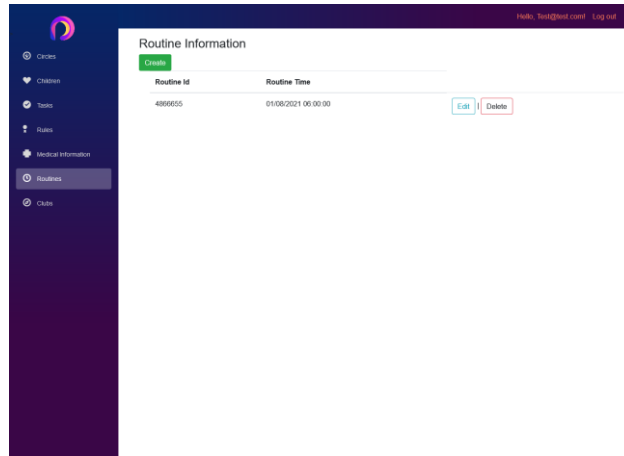
Figure 39 - The read interface for 'Routines' showing a list of created routines. Note the delete button, whereupon pressing the object would be deleted. Thus removing the requirement for a separate interface.
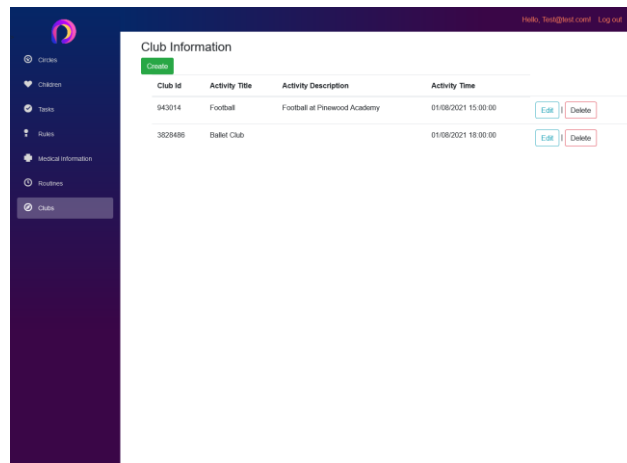
Figure 40 - The read interface for 'Clubs' showing a list of created club information. Note the delete button, whereupon pressing the object would be deleted. Thus removing the requirement for a separate interface.

3.3.2   Security/Privacy

Considering Section 2, subsection 2.2.3 and Functional requirements 05, 05.1 and 05.2, the application should have regard to security and privacy in the following ways.

3.3.2.1   *Security*

- Deploy Authentication / Authorisation user systems to protect data
- Ensure that only data relevant to the user can be accessed.
- Have regard to securing user data through enabling the user to add two-factor authentication to their account.
- Pass connections over secure sockets layer (SSL)
- Encrypt & hash data where possible.
- Time-out sessions / cookies after a period of inactivity and/or re-request the user to authenticate.

3.3.2.2   *Privacy*

- Process requests for deletion of accounts
- Process requests for copies user account information
- Ask users to consent to cookies and tracking, where applicable.
- Comply with Do Not Track requests
- Erase cookies and end sessions upon request
- Collect minimal data from the user and the users client

3.4   Design constraints

Design constraints can be defined by Schedule, Resources and Quality. In theory, each project can select two of these constraints but not have all three. If a project requires Quality, it must sacrifice either schedule (e.g. the deadline) or resources (e.g. cost); similarly if a project has a hard deadline (Schedule), it must sacrifice Resources (e.g. cost, framework, language) or Quality (e.g. functionality, robustness).

In terms of Parentull, the deadline was extended however there was a learning curve for the frameworks chosen when technical choices were made which consumed both time and resources resulting in quality being sacrificed.

Parentull was also conducted during COVID-19 lockdown periods where face to face contact and social meetups were severely limited resulting in mental health issues arising throughout the duration of the project.

4 Design

4.1 System Design
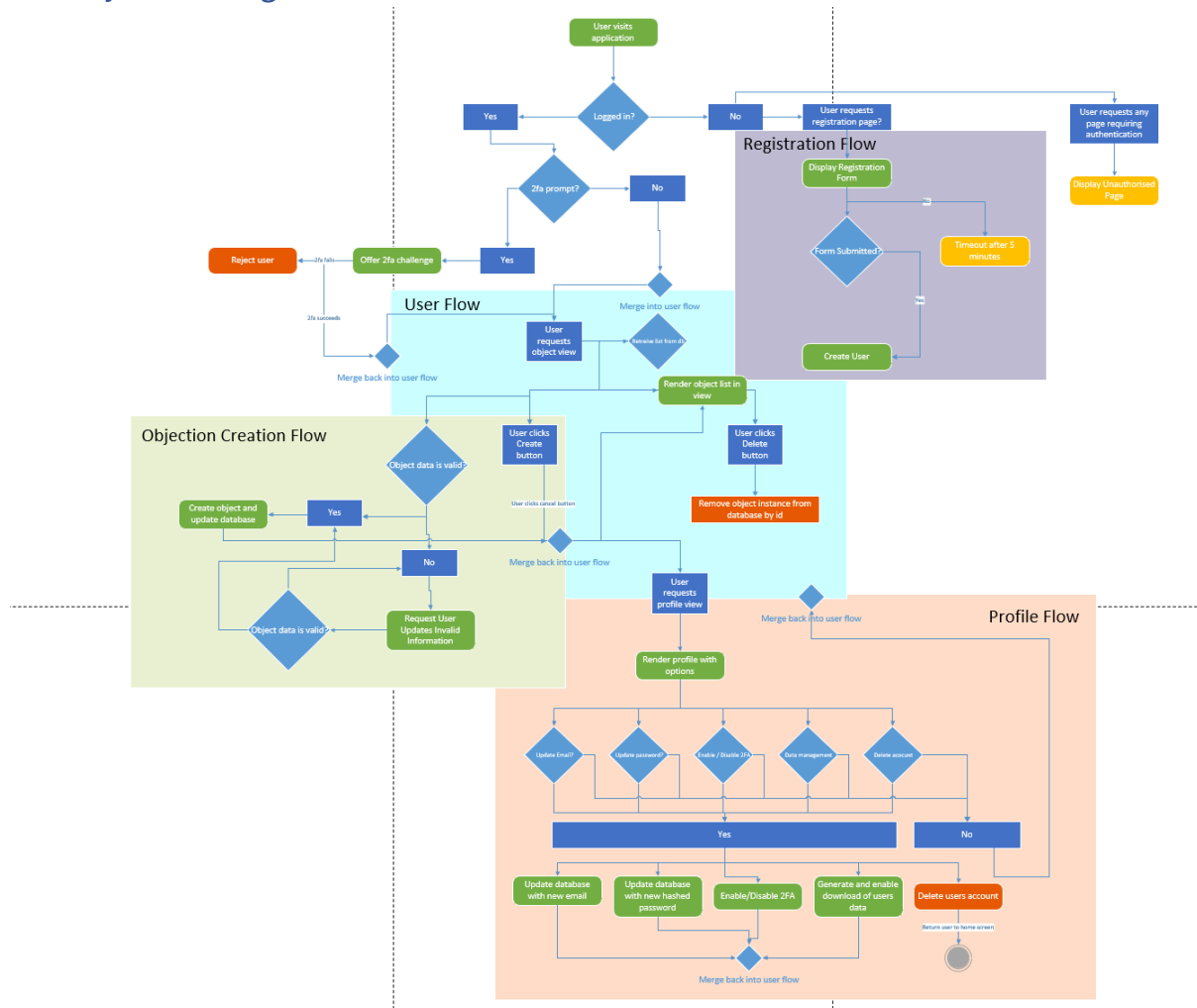
Figure 41 - Flow Diagram of the project, full page version in appendix F

The system flow, as seen in Figure 41, was created by the author to give insight into the mechanisms of Parentull work and meet the objectives of this project. The diagram shows general elements of user interaction as well as Registration, User, Profile and Object Creation Flows and how these flows interconnect.

Beginning with user visiting the application and upon the application determining whether the user is logged in, the application can decide whether or not to process the users requests for content which requires authorisation. By default, if a user is not logged in, these requests are sent to the unauthorised page as seen in Figure 42.
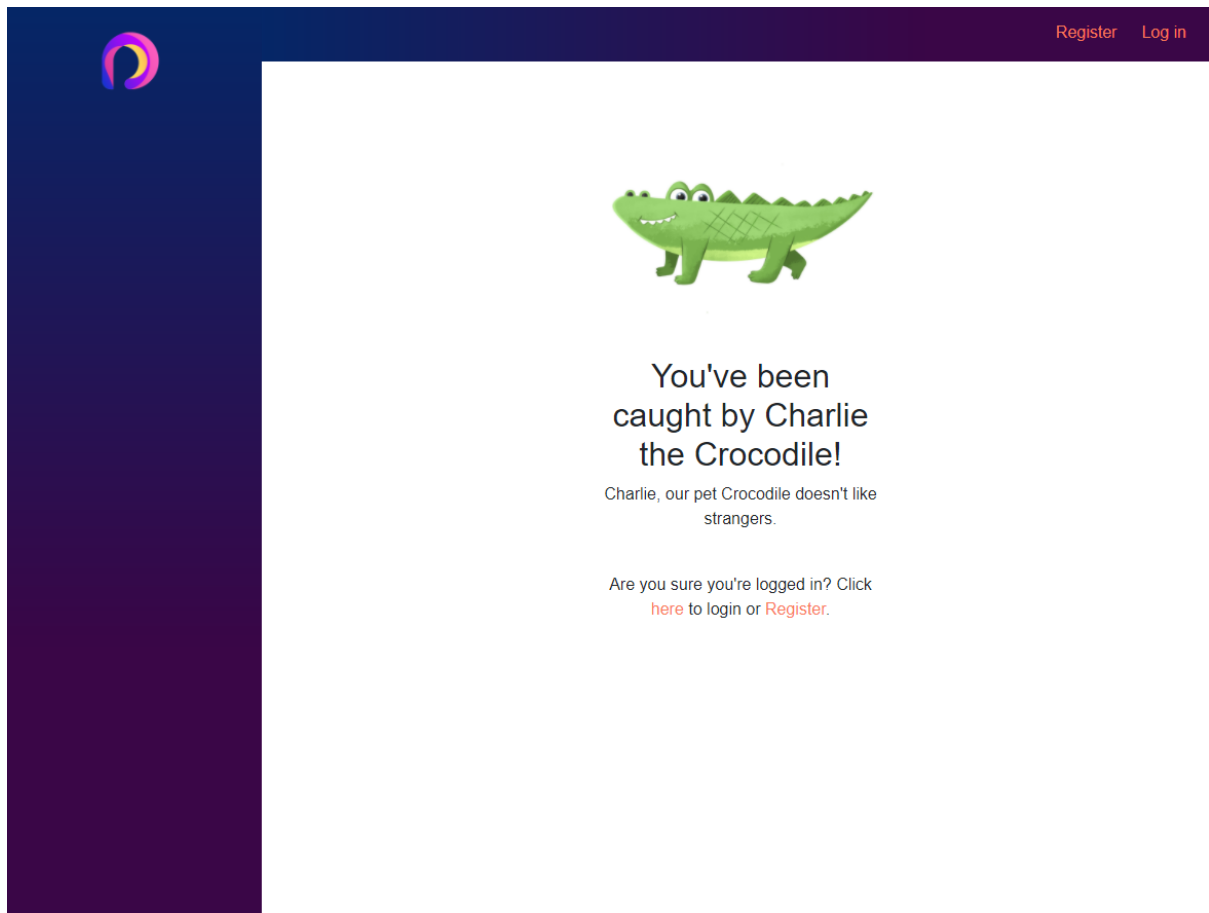
Figure 42 - Unauthorised page in Parentull.

Within the Object Creation Flow, entered by clicking the create button on any object view page, checks are performed to see if the user entries are valid subsequently prompting for a updated information if the information is incorrect before creating the object and merging the user back into the User Flow. Within the User Flow, Users can view information or enter other flows. There is no 'Delete object flow' as users are able to use a function within the User flow to delete objects.

4.2   Logo Design

Early in the project, the author instructed graphic designers via 99designs to pitch logo designs and branding guidelines which could be used within the project. Confirmation of this competition can be seen in Appendix E along with a full list of logos and design elements.

Participants were given instructions to focus on themes such as family, growth, unity and communication. Several hundred submissions were made to the brief from designers around the world however the winning design can be seen in Figure 43, alongside a view of how the branding would work in various situations.

The design was chosen for its use of the P in Parentull seemingly breaking a loop which could be interpreted as the loop as previously mentioned; but also because the reverse could be true, the disconnected elements could be reforming. The design also feels energetic, modern and youthful.
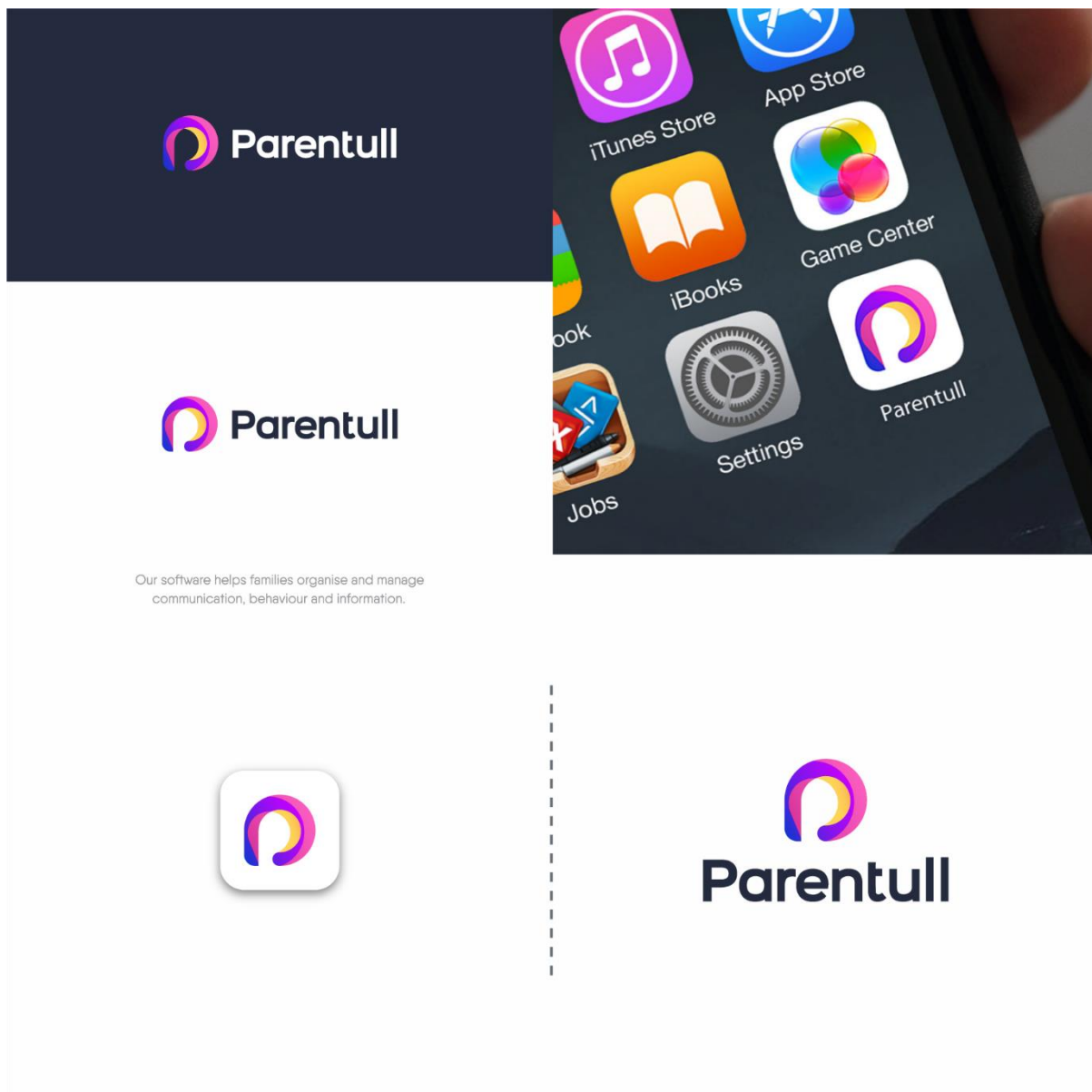
Figure 43 - Chosen branding for Parentull.

4.3   Characters

Considering the context of Parentull and the likelihood of children interacting with the application, it was important that the application had some form of playful, safe and educational manner through which it could communicate with Children. This method should also be a means for children to quickly communicate to adults if they have concerns.

It was decided that this method should be in the form of animals as can be seen in Appendix D. A graphic designer was instructed to create the relevant Characters.

Most children are able to recall simple details, e.g. "*the animal with black and white stripes*" (Figure 44) or "*the one with the spikes*" hence if one were to create an experience within the application where animals guided younger members, played games or were the child's personal identifier throughout the application; this opens up avenues for a richer and more creative experience for all users.

Figure 44 - Badger Character created for Parentull.

In terms of reducing conflict and promoting safeguarding for children, using Characters as personal identifiers instead of custom images uploaded by users allows for children to use that identifying characteristic to report any concerns. Consider the following:

4.3.1 Scenario A – Child reports abuse to Teacher

A family using Parentull are using personal identifiers. Emily, who lives with both parents, starts to experience abusive behaviour at home. She decides to tell her teacher but is embarrassed to reveal it is her parents who make her feel bad so instead tells her teacher "it's the fox and owl".

Outside of the realms of conflict and safeguarding, the animals chosen were predominantly based around British and European wildlife as a means of engaging children with wildlife and ecosystem preservation.

4.4 Data Models

Significant consideration was given to data processed by the system as per Primary Objectives in Section 1.4 and User Stories in Appendix B. The below subsections list each data model, the items which were considered and whether the items were considered essential or non-essential for this project.

4.4.1 User Model

Data Item	Essential/Non-essential	Reason
Email	Essential	Required for user signup and identification

Password	Essential	Required to protect user account
Mobile Number	Not Essential	Email already exists
Date of Birth	Essential	Provides ability to add age-appropriate logic to user accounts.

4.4.2   Circles Model

Data Item	Essential/Non-essential	Reason
Id	Essential	Provides a unique identifier for the object within the database which is the models primary key.
CircleId	Essential	Provides a public facing unique identifier that is useful as a foreign key.
CircleName	Essential	Allows a nickname to be given to the circle by its users making it more identifiable to them.
CreatedAt	Essential	Provides context to when the circle was created and a point in time for when data was being recorded about people within the circle.

```
 9  namespace Cortado.Models
10  {
        26 references | closebracket, 5 days ago | 2 authors, 4 changes
11      public class Circles
12      {
13
14          [Key]
            5 references | Close Bracket, 13 days ago | 1 author, 1 change
15          public Guid Id
16          {
17              get; // Get the id string
18              set; // Set the id string
19          }
20          [Required]
21          [MinLength(30)]
            10 references | closebracket, 6 days ago | 2 authors, 3 changes
22          public int CircleId
23          {
24              get;
25              set;
26          }
27          [Required]
28          [MaxLength(20)]
            9 references | Close Bracket, 13 days ago | 1 author, 1 change
29          public string CircleName
30          {
31              get;
32              set;
33          }
34          [Required]
            6 references | Close Bracket, 13 days ago | 1 author, 1 change
35          public DateTime CreatedAt
36          {
37              get;
38              set;
39          }
40      }
41  }
42
```

Figure 45 - Circle Model Implementation

4.4.3 Tasks Model

Data Item	Essential/Non-essential	Reason
Id	Essential	Provides a unique identifier for the object within the database which is the models primary key.
CircleTaskId	Essential	Provides a public facing unique identifier that is useful as a foreign key.
TaskName	Essential	Taskname gives indication to what should be accomplished. It should be provided even if other details are not.
TaskDetails	Non-Essential	Optional extra details in respect to the task to be completed.
TaskDue	Essential	Provides a deadline for the task to be completed.
TaskNotes	Non-Essential	Optional notes as the task progresses.
TaskIsCompleted	Non-Essential	Task may have been completed but user may not note this in the app. See: Human Element.

Figure 46 - Tasks Model Implementation

4.4.4 Child Model

Data Item	Essential/Non-essential	Reason
Id	Essential	Provides a unique identifier for the object within the database which is the models primary key.
ChildId	Essential	Provides a public facing unique identifier that is useful as a foreign key.
FirstName	Essential	Enables child to be identified in circles and on the database
LastName	Essential	Enables child to be identified in circles and on the database
Age	Essential	Enables age appropriate features and logic to be applied.
Animal Representation	Essential	Enables child specific interfaces and safe guarding features.
Colour Representation	Essential	Enables child specific interfaces and safe guarding features.

Figure 47 - Child Model Implementation

4.4.5   Child Meta Model

Data Item	Essential/Non-essential	Reason
Animal Representation	Essential	Enables child specific interfaces and safe guarding features.
Colour Representation	Essential	Enables child specific interfaces and safe guarding features.

Figure 48 - Child Meta Model Implementation

4.4.6 Rules Model

Data Item	Essential/Non-essential	Reason
Id	Essential	Provides a unique identifier for the object within the database which is the models primary key.
RuleId	Essential	Provides a public facing unique identifier that is useful as a foreign key.
RuleTitle	Essential	Gives context to the rule which an adult wishes to impose
RuleDescription	Non-Essential	Optional description to give further context
RuleTime	Essential	Sets the time for when the rule applies
RulePunishments	Essential	Allows adults to set punishments for naughty behaviour.
RuleRewards	Essential	Allows adults to set rewards for good behaviour.

```csharp
namespace Cortado.Models
{
    18 references | closebracket, 6 days ago | 2 authors, 3 changes
    public class ChildRules
    {
        [Key]
        3 references | Close Bracket, 13 days ago | 1 author, 1 change
        public Guid Id
        {
            get; // Get the id string
            set; // Set the id string
        }
        [MinLength(30)]
        5 references | closebracket, 6 days ago | 2 authors, 2 changes
        public int RuleId
        {
            get;
            set;
        }

        6 references | Close Bracket, 13 days ago | 1 author, 1 change
        public string RuleTitle
        {
            get; // Get the rule title
            set; // Set the rule title
        }

        6 references | Close Bracket, 13 days ago | 1 author, 1 change
        public string RuleDescription
        {
            get; // Get the rule description
            set; // Set the rule description
        }

        6 references | Close Bracket, 13 days ago | 1 author, 1 change
        public DateTime RuleTime
        {
            get; // Get the time for which the rule applies.
            set; // Set the time for which the rule applies.
        }

        6 references | Close Bracket, 13 days ago | 1 author, 1 change
        public string RulePunishments
        {
            get; // Get the rule punishments
            set; // Set the rule punishments
        }
        6 references | Close Bracket, 13 days ago | 1 author, 1 change
        public string RuleRewards
        {
            get; // Get the rule rewards
            set; // Set the rule rewards
        }
    }
}
```

Figure 49 - Rules Model Implementation

4.4.7 Medication Model

Data Item	Essential/Non-essential	Reason

Id	Essential	Provides a unique identifier for the object within the database which is the models primary key.
MedicationId	Essential	Provides a public facing unique identifier that is useful as a foreign key.
MedicationScientificName	Essential	Provides a scientific reference on which to identify medication being referenced.
MedicationNickname	Essential	Provides a nickname by which family / children reference the medication.
MedicationDosage	Essential	Provides the relevant dosage to be taken.
MedicationAdministrationTime	Essential	Provides the time when the medication should be taken.

Figure 50 - Medication Model Implementation

4.4.8   Emergency Contacts Model

Data Item	Essential/Non-essential	Reason
Id	Essential	Provides a unique identifier for the object within the

		database which is the models primary key.
EmergencyContactId	Essential	Provides a public facing unique identifier that is useful as a foreign key.
EmergencyContactFirstName	Essential	Provides a name for the emergency contact in the event of an emergency.
EmergencyContactLastName	Non-Essential	Last name is non-essential if the emergency contact can be identified via first name.
EmergencyContactRTC	Essential	The Emergency Contacts RTC, meaning Relationship To Child, needs to be known in the event of any safeguarding or court issues.
EmergencyContactPrimaryNumber	Essential	Provides a contact number for the emergency contact.
EmergencyContactPrimaryEmail	Essential	Provides an email in the event for the emergency contact.
EmergencyContactPrimaryAddress	Essential	Provides an address in the event that locating the emergency contact must be located in person.

Figure 51 - Emergency Contacts Model Implementation

4.4.9 Routine Model

Data Item	Essential/Non-essential	Reason
Id	Essential	Provides a unique identifier for the object within the database which is the models primary key.
RoutineId	Essential	Provides a public facing unique identifier that is useful as a foreign key.
BedTime	Non-Essential	Non-essential data collection.

```
   4
 5  □namespace Cortado.Models
 6   {
         17 references | closebracket, 6 days ago | 2 authors, 3 changes
 7   □    public class ChildRoutine
 8        {
 9            [Key]
             3 references | Close Bracket, 13 days ago | 1 author, 1 change
10   □        public Guid Id
11            {
12                get; // Get the id string
13                set; // Set the id string
14            }
15            [MinLength(30)]
             6 references | closebracket, 6 days ago | 2 authors, 2 changes
16   □        public int RoutineId
17            {
18                get;
19                set;
20            }
             6 references | Close Bracket, 13 days ago | 1 author, 1 change
21   □        public DateTime BedTime
22            {
23                get; // Get the child's bedtime
24                set; // Set the child's bedtime
25            }
26
27        }
28   }
29
```

Figure 52 - Routine Model Implementation

4.4.10 Checkin Model

Data Item	Essential/Non-essential	Reason
Id	Essential	Provides a unique identifier for the object within the database which is the models primary key.
CircleCheckinId	Essential	Provides a public facing unique identifier that is useful as a foreign key.
CheckInDate	Essential	Objective data which can provide context to circle activity.
CheckinNotes	Non-Essential	Optional category of data, not required to process functional requirements of program.

```csharp
namespace Cortado.Models
{
    // 2 references | closebracket, 6 days ago | 2 authors, 3 changes
    public class CircleCheckins
    {
        [Key]
        // 0 references | Close Bracket, 13 days ago | 1 author, 1 change
        public Guid Id
        {
            get; // Get the id string
            set; // Set the id string
        }
        [ForeignKey(name: "CircleCheckinId")]
        [MinLength(30)]
        // 0 references | closebracket, 6 days ago | 2 authors, 3 changes
        public Guid CircleCheckinId
        {
            get; // Get the id string
            set; // Set the id string
        }
        // 0 references | Close Bracket, 13 days ago | 1 author, 1 change
        public DateTime CheckInDate
        {
            get; // Get the id string
            set; // Set the id string
        }

        // 0 references | Close Bracket, 13 days ago | 1 author, 1 change
        public string CheckinNotes
        {
            get; // Get any checkin notes from the member
            set; // Set any check notes from the member
        }
    }
}
```

Figure 53 - Checkins Model Implementation

5 Implementation and testing

5.1 Implementation

Parentull was implemented using Blazor Server with Entity Framework (Rick-Anderson, no date) integration. Blazor Server was chosen for simplicity of architecture and security compared to its WASM variant. Blazor WASM requests the entire application and runs it locally in the browser (*Blazor | Build client web apps with C# | .NET*, no date) as opposed to Blazor Server which has a traditional client-server connection as depicted in Figure 45.

Entity Framework was chosen for easier management and integration of models with the SQL database (JeremyLikness, no date).
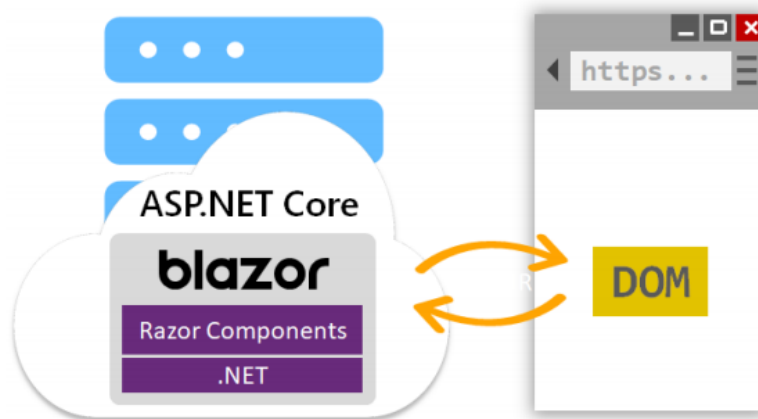

*Figure 54 - Blazor Server Architecture (*Blazor | Build client web apps with C# | .NET*, no date)*

Prior to implementation, there was a steep learning curve to understand Blazor serverside (*Understanding Server-Side Blazor*, no date) as the author had not used the framework previously. Understanding where best to place folders and files for security and accessibility was a first core issue which was overcome following research and numerous errors including not being able to find the fallback endpoint (*blazor - Cannot find the fallback endpoint specified by route values: { page: /_Host, area: }*, no date), encountering issues with CRUD (*Blazor Server App CRUD With Entity Framework Core In .Net 5*, no date) and SQL not null errors (*SQL NOT NULL Constraint*, no date).

Figure 55 shows the system design upon implementation, including classes and data connectivity.
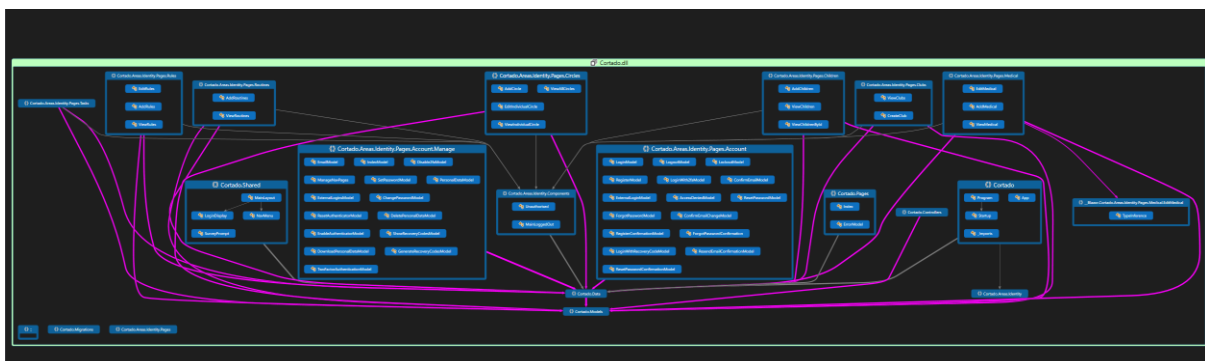

Figure 55 - System Design when implemented

5.1.1 Contexts

Contexts are key aspect of managing data within modern applications in a safe and abstract manner. Within the confines of Entity Framework, Contexts define elements which should be added to a database and aid in modelling. Applications can have multiple contexts. Relevant to Parentull, the application has the following contexts:

5.1.1.1 ApplicationDbContext

The main "context" for the application defining data models and tables. Implementation of these can be seen in Figure 55. The implementation of ApplicationDbContext is not the optimal way to implement such a large amount of models and database tables owing to the reliance it places on one context creating a single point of failure within the application. It would be safer to create contexts for each data set routing access through an interface for the same. Thus, in the event of a failure, the application could retain partial functionality.

The decision was taken to implement Parentull data models within a single Context for speed purposes owing to the deadline. This decision sacrificed some fault tolerance in terms of the application however did allow primary objectives to be met as will be discussed in the evaluation.

Figure 56 - Implementation of ApplicationDbContext

5.1.1.2 IdentityUser / Member Context

As an ASP.NET application, Blazor has a default IdentityUser context which enables simple user functionality such as account creation, account deletion and other CRUD operations in relation to the user. In addition, it enables authentication and authorisation (guardrex, no date) within the application.

Considering the need to create a connection between authenticated users and database items with a relationship to the user, as well as the ability to provide customised experiences relevant to users age, gender and location; it was decided to customise the IdentityUser context by adding scaffolding pages which were present in the application, but were not visual in the code. Figure 56 presents the scaffolded items (highlighted). It was important to preserve the ASP.NET IdentityUser context whilst providing a customised context so the author created a Members class which inherits IdentityUser as seen in figure 57. This class implements custom data items, for example, a Date of Birth which is implemented within scaffolded items. The final element to customising the Identity Context was ensuring that the new Members class was recognised by the scaffolded items.
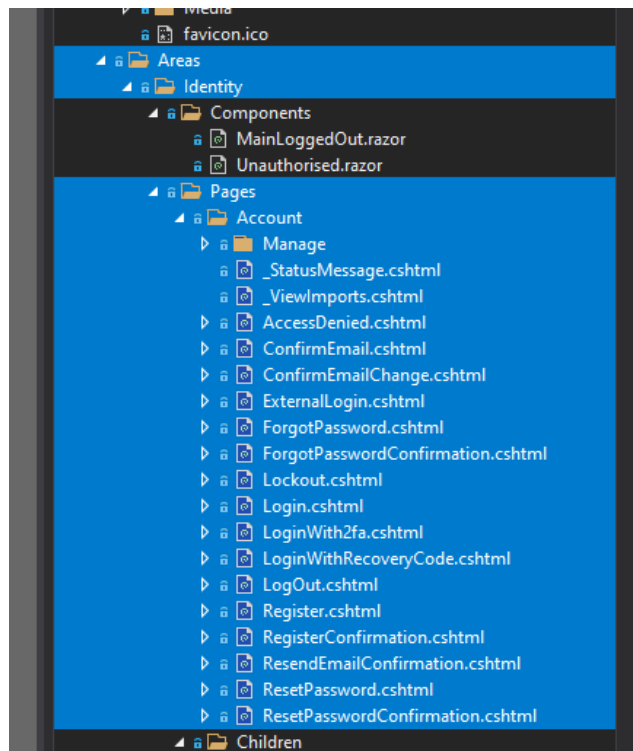
Figure 57 - Added scaffolding

Figure 58 - Members class inheriting IdentityUser

5.1.2   Data and Models

Data models as outlined in section 4.4 were implemented within the application and normalisation was used to reduce duplicate data. Each model was given a Guid Id to be used

internally within the database and an (Object)Id of type int with a minimum length of 30 which could be used as the foreign key and public identifier around the app and in URLs.

One of the largest flaws in the data models is a lack of relationships between items caused by an under utilisation of foreign keys despite prime candidates being present. This issue was again caused by a lack of time for implementation however is well noted. As a result of the lack of foreign keys and relationships between objects, in particular between objects and 'circles' which are supposed to serve as a dashboard, the functionality has suffered immensely. Resolving this issue may involve refactoring models and code to account for functionality that does not exist or has not been written.

To implement functionality that is present, an interface has been written called "IDataAccess". Inheriting a similar problem to ApplicationDbContext, IDataAccess provides a single point of failure and it would serve well for future development to decouple data access through multiple interfaces related to object types; not only to avoid single points of failure but to improve clarity of code. Never the less, IDataAccess provides a list of tasks which are subsequently implemented using Async programming techniques by DataAccess as depicted in Figure 58.

```csharp
48        // Get All Circles
          2 references | Close Bracket, 12 days ago | 1 author, 3 changes
49        public async Task<IEnumerable<Circles>> GetCircles()
50        {
51            try
52            {
53                return _ctx.Circles.ToList();
54            }
55            catch (Exception ex)
56            {
57                throw new Exception(message:ex.Message + "Failed while returning all circles");
58            }
59
60        }
61
          2 references | Close Bracket, 12 days ago | 1 author, 1 change
62        public async Task<Circles> AddCircle(Circles circles)
63        {
64            var result :EntityEntry<Circles> = await _ctx.Circles.AddAsync(circles);
65            await _ctx.SaveChangesAsync();
66            return result.Entity;
67        }
68
```

Figure 59 - Example tasks from DataAccess

5.1.3   Razor Components

Razor components can be used in two ways, they can act like a page by defining the "@page" attribute or as an element within a page by defining the component somewhere within a page. For Parentull, Razor Components were used in both capacities.

```
1  <div class="row">
2      <div class="col-md-4">
3
4      </div>
5      <div class="col-md-4 text-center">
6          <img src="/Media/ali-aligator.jpg" width="100%" />
7          <h2>You've been caught by Charlie the Crocodile!</h2>
8          <p>Charlie, our pet Crocodile doesn't like strangers.</p>
9          <br />
10         <p>Are you sure you're logged in? Click <a href="/Identity/Account/Login">here</a> to login or <a href="/I
11     </div>
12     <div class="col-md-4">
13
14     </div>
15 </div>
16
17 @code {
18
19 }
20
```

Figure 60 - Code for Unauthorized Razor Component

Figure 60 shows code which defines part of a page and was used to display content when a user was not logged in as part of the authorisation technique to meet objectives and professional obligations. If the component was invoked, it would display content as seen in Figure 61:
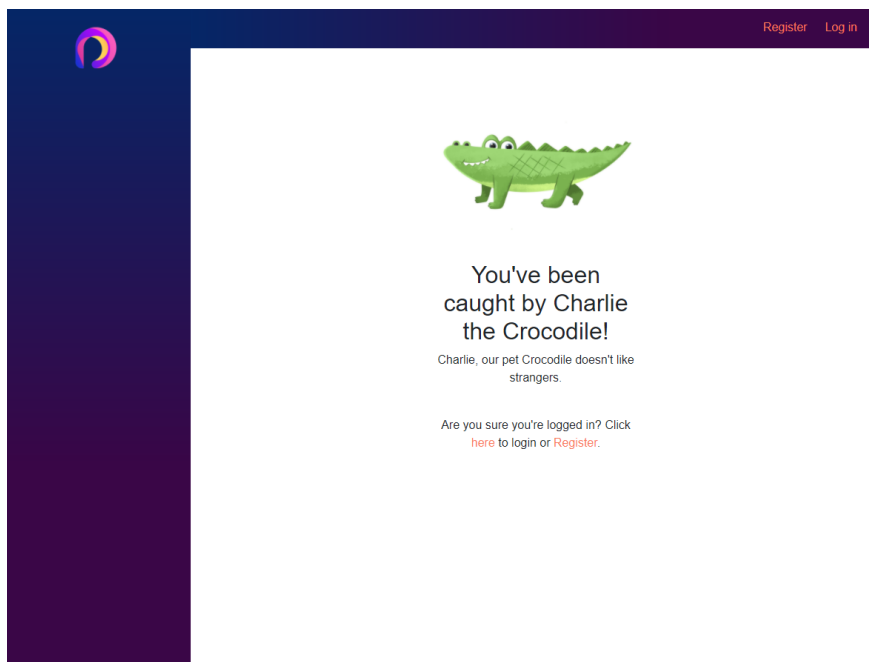

Figure 61 - Unauthorised page

Figure 62 shows the authorisation technique used to invoke code in the components:

Figure 62 - Code where authorisation code is invoked

6 Evaluation

Revisiting the Primary Objectives for Parentull, it was stated that research would be conducted into user requirements subsequently resulting in user requirements such as user stories and views. This objective has been met through the thorough research into the background domain and needs of families and subsequent user stories in Appendix B. There were however missed opportunities to gain further research when the University of Hull hosted a "nightingale family court" through the pandemic; had the opportunity arisen to conduct research with professionals and participants of the court during the pandemic, this project could have given perspective on other requirements and technical developments.

In terms of the in-app data and normalisation requirement, Parentull has met this requirement through use of normalisation and consideration of which data should be required during collection and which data should be optional. Further this also complies with GDPRs data minimalization policy.

Likewise, an alpha version of Parentull was created for the web using Blazor which meets the requirement despite originally suggesting in the PID that the objective was to create an Android application. This change is positive given the upcoming changes in .NET MAUI and the experimental bindings presently available which will allow for secondary objectives to be completed in the future.

Unfortunately, whilst a web app was created the functionality is severely limited and created objects are exposed to all users as a result of lacking database modelling and user identity binding. Whilst these are minor issues, it unfortunately means that full compliance with GDPR cannot be met and the application has large security and privacy holes. The end result being that it is unsafe for real user data owing to the risk of exposing personal information.

Similarly, full CRUD functionality is not available despite being one of the requirements of the application. Whilst Create, Read and Delete are implemented, Update was not despite code being written for it.

Fortunately, The application does allow users to submit a 'subject access request' by downloading a copy of their personal information. This does not come in the form of a .zip file, but is instead a JSON file; however this still satisfies the requirements owing to it being a portable format. Similarly, users can delete their account to stop processing of data.

7   Conclusion

Parentull set out to explore how technology could aid families become more organised and break the cycle of conflict creating a solution that was available on as many platforms as possible. A technical solution to this problem does not yet exist despite the advancement in societal norms and technology in the last 50 years. Having spoken to long time researchers and professionals in legal and domestic abuse / violence sectors, Parentull has gained support, notably from Erin Pizzey, see figure 63, founder of the refuge movement.

This is a very interesting idea all of my work is with violence prone families where their is a lot of conflict and in most cases very little education but of course these are the parents that most need help. I have always pointed out that the roots of domestic violence lie in generational family violence and dysfunction how do you see your program working with this sort of family?

I applaud your whole project and can see it working well with conflicted parents who are able to understand your programs it may just be that my families are not suitable candidates though many of them will come to mandated mediation and there your program could be used with supervision?

Sent from my iPad

On May 1, 2021, at 11:53 PM, EDWARD RICHMOND <E.C.RICHMOND-2017@hull.ac.uk> wrote:

Figure 63 - Email from Erin Pizzey

Despite the support, the end product for this project cannot be considered a success professionally owing to the flaws as mentioned in Section 6. Whilst the end product is an alpha version, and so will require further development, it cannot be said, in its current form, that it could aid families in resolving disputes or becoming more organised. The reverse might actually be true if users were truly combative, and information were incorrectly exposed.

On the other hand, the project could be considered a success since the majority of objectives were met and the failures in the program could be rectified through further development. The point has been proven that a solution can be implemented for complex domestic problems which process large amounts of information. Similarly, the project could be considered a success owing to the willingness of the author to adhere to Agile methodology and pivot from Xamarin to Blazor when new information came to light.

The author would have liked further user input from the intended audience through research with courts, which would have provided primary research data to expand requirements but also consider data processing needs and how users might try to manipulate the system. Similarly, author feels the project would have benefited the project to have been test-driven from the beginning however this was not the case so no test cases were available. In the future, test cases will be created for Parentull as this is another area of failure which could produce data to show where weak points are within the application.

In terms of future development, author believes it would be appropriate to investigate accessibility options including any hardware which disabled and elderly people might use to navigate applications. Whilst this was mentioned in User Stories, accessibility was not part of the project objectives or explored as part of the project in general however is an interesting topic for exploration in future development.

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Appendix A – Child Welfare Principle

- 1) ANY QUESTION WITH RESPECT TO –
    - o THE UPBRINGING OF A CHILD; OR
    - o THE ADMINISTRATION OF A CHILD'S PROPERTY OR THE APPLICATION OF ANY INCOME ARISING FROM IT, THE CHILD'S WELFARE SHALL BE THE COURTS PARAMOUNT CONSIDERATION.
- 2) IN ANY PROCEEDINGS IN WHICH ANY QUESTION WITH RESPECT TO THE UPBRINGING OF A CHILD ARISES, THE COURT SHALL HAVE REGARD TO THE GENERAL PRINCIPLE THAT ANY DELAY IN DETERMINING THE QUESTION IS LIKELY TO PREJUDICE THE WELFARE OF THE CHILD.
- 2A) A COURT, IN THE CIRCUMSTANCES MENTIONED IN SUBSECTION (4)(A) OR (7), IS AS RESPECTS EACH PARENT WITHIN SUBSECTION (6)(A) TO PRESUME, UNLESS THE CONTRARY IS SHOWN, THAT INVOLVEMENT OF THAT PARENT IN THE LIFE OF THE CHILD CONCERNED WILL FURTHER THE CHILD'S WELFARE.
- 2B) IN SUBSECTION (2A) 'INVOLVEMENT' MEANS INVOLVEMENT OF SOME KIND, EITHER DIRECT OR INDIRECT, BUT NOT ANY PARTICULAR DIVISION OF A CHILD'S TIME.
- 3) IN THE CIRCUMSTANCES MENTIONED IN SUBSECTION (4), A COURT SHALL HAVE REGARD IN PARTICULAR TO –
    - o THE ASCERTAINABLE WISHES AND FEELINGS OF THE CHILD CONCERNED (CONSIDERED IN LIGHT OF HIS AGE AND UNDERSTANDING);
    - o HIS PHYSICAL, EMOTIONAL AND EDUCATIONAL NEEDS;
    - o THE LIKELY EFFECT ON HIM OF ANY CHANGE IN HIS CIRCUMSTANCES;
    - o HIS AGE, SEX, BACKGROUND AND ANY CHARACTERISTICS OF HIS WHICH THE COURT CONSIDERS RELEVANT;
    - o ANY HARM WHICH HE HAS SUFFERED OR IS AT RISK OF SUFFERING;
    - o HOW CAPABLE EACH OF HIS PARENTS, AND ANY OTHER PERSON IN RELATION TO WHOM THE COURT CONSIDERS THE QUESTION TO BE RELEVANT, IS OF MEETING HIS NEEDS;
    - o THE RANGE OF POWERS AVAILABLE TO THE COURT UNDER THIS ACT IN THE PROCEEDINGS IN QUESTION.
- 6) IN SUBSECTION (2A) 'PARENT' MEANS PARENT OF THE CHILD CONCERNED; AND, FOR THE PURPOSES OF THAT SUBSECTION, A PARENT OF THE CHILD CONCERNED
    - o IS WITHIN THIS PARAGRAPH IF THAT PARENT CAN BE INVOLVED IN THE CHILD'S LIFE IN A WAY THAT DOES NOT PUT THE CHILD AT RISK OF SUFFERING HARM; AND
    - o IS TO BE TREATED AS BEING WITHIN PARAGRAPH (A) UNLESS THERE IS SOME EVIDENCE BEFORE THE COURT IN THE PARTICULAR PROCEEDINGS TO SUGGEST THAT INVOLVEMENT OF THAT PARENT IN THE CHILD'S LIFE WOULD PUT THE CHILD AT RISK OF SUFFERING HARM WHATEVER THE FORM OF THE INVOLVEMENT.

Referenced from (Oldham, 2016)

Appendix B – Parentull User Stories

The following user stories define potential interactions and objectives between users and Parentull. Each user story will enable further exploration of that specific user base and their objectives narrowing down the development pathway to meet their needs.

It is important to define potential user stories and objectives so that the application can develop and explore other areas of functionality, user views and extinguish pitfalls and misuse by users. A specific example related to Parentull being that single mothers will not have the same priorities or requirements for user views as married couples or expecting parents; therefore the application can present a better overall experience by excluding irrelevant information/views for that user.

Contents

7.1   Definitions
IS = In Scope
NIS = Not in Scope

7.2   Cases
Below are cases which will be considered for integration into Parentull or a sibling application in time. If the case is in scope for this project, it is labelled IS, otherwise it is labelled NIS.

7.2.1 Normal Cases (Adult)
- Expecting parents (IS)
- Single mother (IS)
- Single father (IS)
- Grand parents (IS)
- Married couple (IS)
- Step parents (IS)
- Extended family members (NIS)

7.2.2 Normal Cases (Child)
- Child (IS)
- Sibling(s) (IS)
- Extracurricular club members (NIS)
- Classmates (NIS)
- Friends (NIS)

7.2.3 Professional Cases
- Social worker (NIS)
- Teacher (NIS)
- Teaching Assistant (NIS)
- Health Worker (NIS)
- Doctor (NIS)
- Dentist (NIS)
- Extra-curricular role models (Sports coach, Scout leader, Duke of Edinburgh) (NIS)
- Counsellor (NIS)
- Youth worker (NIS)

7.3 User Scenarios

7.3.1 Expecting Parents – Mr. & Mrs. Cramer

Mr. & Mrs Cramer are a married couple in their early 30s expecting their first child. The couple own a 4 bed terraced home, lead busy professional and social lives and have an extensive support network in the form of paternal and maternal family members, friends and work colleagues.

Mr. & Mrs. Cramer both use desktop/laptop computers and have access to smartphones, tablets and other 'smart devices'. They are fairly confident adjusting to advances in technology and use software to improve their daily life. Reasonable costs are not an issue to Mr. & Mrs. Cramer since both are working full time.

As this is their first child, Mr. & Mrs. Cramer are keen to get organised as early as possible so as to minimise unexpected events in care routines and maximise the efficiency of their care giving, time management and child's development. In particular, Mr. & Mrs. Cramer are keen to share information with their closest circle who will be caring for their child at certain times when both parents are unavailable.

As a:	I want to:	So that:
Expecting Parent	Setup a 'Circle'	I can use the app with my support network.
Expecting Parent	Invite family and friends to join.	I can grow my circle and share information with them.
Expecting Parent	Setup care routines, feeding and nap times.	I can set mutually agreed care arrangements with the circle which can be shared with temporary care givers.
Expecting Parent	Add medical information about my children.	I can inform all circle members about important medical updates.
Expecting Parent	Add allergy information about my children.	I can inform all tribe members about important allergy information and what to do in case of an emergency.
Expecting Parent	Add clothing size information about my children	I can inform all circle members about my child's clothing size.
Expecting Parent	Add medication routines	I can inform all circle members when to administer medication.
Expecting Parent	Request confirmation that medication was administered to my children.	I can verify that my child was given medication at the correct time
Expecting Parent	See upcoming events for my child and pre-book appointments.	I can arrange my schedule in advance and ensure that there are no conflicts.

Expecting Parent	Easily import calendar and work information from third party accounts.	I can show other tribe members when I am busy or need help with childcare.
Expecting Parent	See relevant information and groups in my local area with reviews from other parents.	I can gather information and join in local groups outside of my circle.
Expecting Parent	See gender specific health and wellbeing information as well as a list of local agencies and their contact information.	So that I can access support or self-manage if there is a concern about health concerns, including mental health.

7.3.2   Single Mother - Chantelle Pickle

28 year old Chantelle is a single mother living alone with her 7 year old son, Alex. Chantelle did not attend further or higher education programmes following secondary education as she did not obtain high enough GCSEs to meet the entry criteria; instead, Chantelle worked alongside her aunt as a cleaner until she fell pregnant with Alex.

Owing to her restricted income, Chantelle's primary mode of accessing the internet is her smart phone; she does not own a laptop, desktop, tablet, printer or have a landline/fixed internet connection. The last time Chantelle used a desktop environment was over 1 year ago when she had to complete benefit application forms online at the public library.

Alex's biological father is not involved directly however does pay child maintenance though these payments are sometimes late and a cause of stress for Chantelle owing to long phone calls to the support centre doing repetitive follow ups.

Chantelle has a strong familial and friendship support network. This includes some members of Alex's biological father's family who maintained contact with Chantelle and Alex.

In the future, Chantelle would like to go to college to obtain hair dressing qualifications as she dreams of opening her own salon.

Chantelle's user stories are as follows:

As a:	I want to:	So that:
Parent	Setup a 'circle'	I can use the app with my support network.
Parent	Invite family and friends to join.	I can grow my circle and share information with them.
Parent	Setup household rules and expectations within the	I can set clear boundaries for my children who can follow my guidance and

	app which all members can see.	other role models can understand behavioural expectations.
Parent	Setup rewards for good behaviour. An example might be extra points.	I can reward my children for good behaviour or completing tasks as well as setting up prescribed rewards for temporary carers.
Parent	Setup punishments for bad behaviour. An example might be reduction in points.	I can instil good values in my children when they do not follow correct behaviour.
Parent	Add medical information about my children.	I can inform all circle members about important medical updates.
Parent	Add allergy information about my children.	I can inform all circles members about important allergy information and what to do in case of an emergency.
Parent	Add clothing size information about my children	I can inform circle members about my child's clothing size(s).
Parent	Add medication routines	I can inform all circle members when to administer medication.
Parent	Request confirmation that medication was administered to my children.	I can verify that my child was given medication at the correct time
Parent	See upcoming events for my child and pre-book appointments.	I can arrange my schedule in advance and ensure that there are no conflicts.
Parent	Easily import calendar and work information from third party accounts.	I can show other circle members when I am busy or need help with childcare. For example, showing my college timetable to circle members.
Parent	Easily import information from school like newsletters, reports and attendance.	I can share this with other members of the circle without having to individually message everyone.
Parent	Easily send information to school	I can keep in touch with my children's school and their teachers whilst informing

		them of any important updates on the go.
Parent	Easily send payments to school for trips, dinner money and uniform.	I can ensure that all outstanding payments to the school are cleared.
Parent	Easily allow other circle members to see payments requested and sent to school	I can evidence to the circle that payments have been made.
Parent	Setup a payment arrangement with my ex-partner which is viewable by the whole circle.	I can seek help from the circle when payments to support my children are missed.

7.3.3   Scott Dudley – Single Father

32 year-old Scott is a separated father who has care of his daughter, Samantha Dudley. He is university educated having obtained a BA Business Management and has a moderate understanding of technology; normally using tablet and desktop computers for work activities. He rarely uses social media but does have a smart phone. In his own time, Scott enjoys playing football and volunteering for local charities.

During separation, Scott disclosed that he had been the victim of domestic abuse and authorities intervened to ensure that Samantha and Scott were safe; the safety plan, created by authorities to keep Scott and Samantha safe, included making sure that Scott's personal contact information is not shared with his ex-partner and that he can limit the amount of contact with his ex-partner so that he can feel safe. Scott also has several contacts with whom he has a 'code word' to use if he or Samantha are in danger.

Scott wants to share information with his ex-partner about Samantha in a way that doesn't compromise her or his safety. Scott is also keen to ensure that Samantha's schedule, boundaries, and other information are clear to all family members so that the risk of manipulative or defection from planned timetabled events is reduced.

Scott's user stories are as follows:

As a:	I want to:	So that:
Parent	Setup household rules and expectations within the app which all members can see.	I can set clear boundaries for my children who can follow my guidance and other role models can understand behavioural expectations.

Parent	Receive updates about my child from third parties (outside the circle)	I can keep up to date about my childs progress, needs and safety.
Parent	Send updates about my child to third parties (outside the circle)	I can inform third parties about my child's progress, needs and safety. For example, sending information directly to a social worker or teacher.
Parent	Limit communication from certain circle members	I can feel safe whilst participating in the circle
Parent	Limit words, phrases and other potential abuse triggers through personalised filters	I can create a personalised experience within the circle whereby I will not encounter content that is likely to create flashbacks to abusive situations or upset me.
Parent	Post updates to the circle about my child	I can keep the circle updated with my child's progress.
Parent	Add information about my child that circle members should know	I can keep the circle updated with important information about the care of my child.
Parent	Send a ping to select members of the tribe to alert them I or my child need help	I can send an alarm / distress call to multiple trusted circle members in the event of an emergency. I am supposed to alert trusted contacts if I need help through my domestic abuse safety plan.
Parent	Add my childs timetable and activities to a shared circle Calendar	Keep the tribe updated with my childs routine and routine events.
Parent	Restrict content from view of certain tribe members	I can post content and information in the knowledge that circle members who are not allowed to see certain information, for example, my contact information or location, will not be able to view that information.
Parent	Protect my messages and information with a password	I can feel safe that if someone accesses my device, my messages and information are still safe.

7.3.4 Michelle & George – Grandparents

Michelle & George are approaching retirement age and hold part time jobs to tide them over alongside savings and other investments. They have 3 grandchildren with whom they try and maintain regular contact.

Michelle has difficulty with her eyesight and regularly has injections which provide temporary relief to her vision but eventually she will go blind. George is in good health overall but is suffering from reduced movement abilities owing to his age.

Both Michelle and George try to keep active tending to their home and garden. Michelle and George do not keep smart phones or other such devices preferring to share a desktop computer which they bought several years ago as neither understand much about technology or the internet.

Often when using the computer, Michelle and George will sit together so that they can help each other work out where to click and how to get to the resource they want next.

As a:	I want to:	So that:
Grand Parent	Have an easy to use and understand interface	I can use the software to find out about my grandkids.
Grand Parent	Adjust the app for my visual impairments and health conditions	I can enable adaptive interfaces to suit my poor eyesight.
Grant Parent	Be able to use the app with a tactile interface	Blindness does not affect my ability to keep in touch with my grand children.
Grand Parent	Specify my health conditions within my profile	Circle members and the software can take my health into account when requesting help and locations. In particular, I have reduced movement and therefore need locations with assistance and/or mobility scooters.
Grand Parent	See household rules and boundaries within the circle.	I can work with boundaries set for my grandchildren who can follow my guidance and other role models to understand behavioural expectations.
Grand Parent	Receive updates about my grandchildren from third parties (outside the circle)	I can keep up to date about my grandchildren's progress, needs and safety.
Grant Parent	Be able to communicate with my grand childs teachers and mentors	I can be more involved with their education and daily activities.

Grand Parent	Limit communication from certain circle members for a period of time.	I can enjoy my experience within the circle without unwanted communication.
Grand Parent	Post updates to the circle about or for my grandchildren.	I can keep in touch with my grandchildren.
Grand Parent	See information about my grandchildren	I can keep up to date with relevant care and medical information.
Grand Parent	Send a ping to select members of the circle to alert them I need help.	I can inform trusted members of the circle if I need assistance, either when caring for my grandchildren or when alone at home.

7.3.5   Frank & Rose – Married Couple

Frank & Rose have been married for several years and have four children together. Frank is the main bread winner in the household working as a delivery driver for a supermarket. Rose manages the family's affairs at home and takes care of the children. The family has an extensive support network consisting of family, friends, work colleagues and third parties.

Both Frank and Rose have an average understanding of technology using laptops, smart phones and tablets on a day to day basis.

Janet, their eldest daughter suffers from Epilepsy, an often-unseen disability which results in seizures. The seizure frequency fluctuates week by week and can often result in Janet missing school or needing urgent assistance as a result. Frank and Rose often find themselves spending more time with Janet tending to her care needs. In some cases, this has resulted in their other children missing out on opportunities at school, clubs and in their social life.

As a:	We want to:	So that:
Married couple	Receive information from school	We can keep our children up to date with home/missed work.
Married couple	Receive updates from clubs and extra-curricular activities	We can keep our children up to date with their activities and well socialised.
Married couple	Have a shared weekly planner in the circle where we can see all our family and children's activities.	We can plan our schedule and request assistance from other circle members if required.
Married couple	Track our children's medical emergencies and information	We can present this information to professionals and keep a

		record of important medical events.
Married Couple	Have a list of emergency and important contacts for each child	We can respond to developing situations without worrying about who to contact.
Married couple	List our children's medication and the frequency in which it should be taken	Members of the circle are aware of how the children's medication should be administered and what medication is being taken in the event of an emergency
Married couple	Set agreed rules with rewards and punishments each child in our circle	The children can see behavioural expectations and the consequences, either negatively or positively for their behaviour.
Married couple	Automate some finances related to the children, for example, pocket money and school/third party payments.	We can ensure that our children's activities, school trips and clubs are paid for in one place and ensure that pocket money is distributed equally.
Married couple	Set household tasks for our children to complete in exchange for rewards.	The children are aware of which tasks they must complete around the home.
Married couple	Request the children check in via their own devices and have their location recorded on the circle.	We know where the children are when they are out with their friends and can make sure they are safe.
Married couple	Request a carer/baby sitter from members of the circle who have indicated they will be available at short notice	So that we can respond to an emergency or ensure all of the children have an appropriate adult with them.
Married couple	Request a baby sitter from a directory of vetted baby sitters	We are able to take time as a couple away from the children.
Married couple	Have access to a directory of local children's clubs/groups/play areas	We are able to keep the children entertained and engaged.

7.3.6 Albert/Stacey – Step parents

Step parent viewing children information to keep up with information as needed.

Albert is a self-employed tradesman working for letting agents maintaining housing stock. In his spare time, Albert likes to play / watch football and go to the pub with his friends. Earlier in life, Albert went through a divorce after becoming a father to two biological daughters at a young age leading to mental health issues such as depression, anxiety and suicidal thoughts.

In the present, Albert has found love again with single mum, Stacey, who has a son. Stacey's ex-partner is not involved. Albert and Stacey live together and regularly have contact with Albert's daughters.

As a:	I want to:	So that:
Step parent	Maintain my own circle and be part of my step-children's circle.	I can help them develop and receive information as needed.
Step parent	See my step-child's schedule	I can play an active role in their life
Step parent	See my step-child's medical and allergy information	I can avoid giving wrong information to professionals and harmful substances to the child.
Step parent	Be able to 'check in' to locations when I have care of children	I can evidence where we have been and the time we were there.
Step parent	Have a list of emergency and important contacts for each child	We can respond to developing situations without worrying about who to contact.

7.3.7   Child
The user stories for children have been shortened to 'wants'.

As a:	I want to:
Child	Keep in touch with everyone important to me
Child	Share interesting stories and pictures with my family and friends.
Child	Share updates from clubs and school
Child	Show that I have completed homework and other tasks
Child	See rules that adults have set for me
Child	See information, like my bedtime and how long until the next club activity.
Child	Share information with my siblings and friends.

7.3.8   Sibling(s)

The user stories for siblings have been shortened to 'wants'.

As a:	I want to:
Sibling	Share information with my family, siblings and friends
Sibling	Challenge my siblings to events, like who can complete the most tasks in 10 minutes.
Sibling	Keep a private journal that only I can read.
Sibling	See how much pocket money I have and be able to buy things.

Azure for Students

F6C2A109-6674-44A1-A005-F31F513BF831

Subscription Cost: $122.76

SERVICE NAME	SERVICE RESOURCE	SPEND
Application Gateway	Fixed Cost	$50.25
Azure Firewall	Standard Deployment	$35.88
Application Gateway	Capacity Units	$27.67
API Management	Developer Units	$7.76
Virtual Network	Standard Static Public IP	$1.15
Bandwidth	Data Transfer Out - NAM or EU To Any	$0.02
Azure App Service	B1	$0.01
Network Watcher	Diagnostic Tool API	$0.01
Log Analytics	Data Ingestion	$0
Bandwidth	Data Transfer Out	$0
Key Vault	Operations	$0
Key Vault	Advanced Key Operations	$0
Storage	Batch Write Operations	$0
Storage	Read Operations	$0
Storage	All Other Operations	$0
Storage	LRS Data Stored	$0
Storage	LRS Write Operations	$0
Storage	Write Operations	$0
Storage	LRS List and Create Container Operations	$0
Azure App Service	F1	$0
Azure Cosmos DB	Free 100 RU/s	$0
Azure Firewall Manager	Policies per Region	$0
Bandwidth	Data Transfer In	$0
Bandwidth	Data Transfer Out - Free	$0
Storage	LRS Data Stored - Free	$0
Storage	LRS Write Operations - Free	$0
Storage	Protocol Operations - Free	$0
Storage	Read Operations - Free	$0

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Home / Logo design / Logo design contests / Design a logo for a family orientated business/app...

Design a logo for a family orientated business/app.

by edwar2G

£239   Bronze

👁 Watchers (0)

Brief   **Designs**   ···

⏰ All designers have 4 days left to submit design concepts.

No designs yet

Design services	Support	Resources	Company
Design contests	Help	Pricing	About
1-to-1 Projects		Become a designer	Contact
Find a designer		Blog	
Discover inspiration		99awards	
Agencies			
99designs Studio			
99designs Select			
API integrations			

Appendix C – Community Brands Data Processing

Subsidiary	Website	Solution(s)	Data Processed

Eduspot	eduspot.co.uk	School App	- Parent Information
			  o Contact information
			  o Child/ren associated
			- Child information
			  o Class/Teacher information
			  o Awards
			- Term calendar
			- Messages
			- School noticeboard
			- School dinner menu
			- School club list/payments
			- School shop
			  o Payments
			  o Customer information
			  o Inventory

		School Pod	- Staff information
			- Student information
			  o Attendance
			  o Behaviour
			  o Family information
			  o Safeguarding
			  o Emergency contacts
			- Census information
			- Behaviour information
			- Assessment information

		SchoolMoney	- Payment processing - Overdue payments - Contact information - Extra-Curricular activities / fees
		BehaviourWatch	- Ofsted report information - Real time league table comparison - SEN (Special needs) information - Behaviour tracking o By time

			o By weather o By date o By term - Safeguarding referral - Safeguarding tracking - Report generation
		SchoolAwards	- Incident tracking - Multiple data point report generation including behaviour, accident, play, contact and child medication information. - Awards
		Parents Evening	- Event invites - Event booking - Event schedule - Update event information with topics/conversation points
		Cashless Catering	- Selection of school meal - Addition of menu items - Financial information
		Teachers2Parents	- Parent + Child information - Internal School forms - Text messages to parents - Email + categorisation of emails Events organisation
Educate	educatesis.com	Student Information System	- Admission & Enrollment information - Financial aid & Award management - Tuition management - Grading/Attendance information - Payment information - Family and Student information - Report generation

		Health Screening Mobile App	- Medical information (e.g. COVID-19 test results)
Diamond Mind	diamondmindinc.com	Payment processing	- Credit card information - Customer Address - Product/Services information - Bank merchant meta data - School financial information
		Tuition Pay	- Parent information - Student information - Tuition plan information - Financial information - Payment information - Outstanding balance
		Campus Pay	- Payment receipts - Email tracking - Payment notifications - Recurring payment information o Storing payment details - Report creation - Custom data created by client
School Speak	schoolspeak.com	Student Information System	- Student/Family data - Attendance - Grade book - Performance Analysis - Report card - Homework - Archived data
		Online Communication	- Newsletters & Announcements - Calendars - Mass email - Emergency Notification - School Apps

Appendix D – Characters

CAT

CAT

SHARK

CROCODILE

HIGHLAND
COW

PENGUIN

Appendix E – Parentull Branding

Home / Logo design / Logo design contests / Design a logo for a family orientated business/app...

Design a logo for a family orientated business/app.

£239 Finalist

by edward2G   👁 Watchers (0)

Brief   Designs   ...

🏆 All designers have 4 days left to submit design concepts.

Background information
Visual style
References
Deliverables

Background information

Name to incorporate in the logo
Parentull

Slogan to incorporate in the logo
Unspecified

Description of the organization and its target audience
Our software helps families organise and manage communication, behaviour and information.

Industry
Technology

Visual style

Colors to explore

Designers choose

Other color requirements
Unspecified

Style Attributes

Classic ———————————●—— Modern

Mature ————●———————— Youthful

Feminine ————●———————— Masculine

Playful ————●———————— Sophisticated

Economical ——————●———— Luxurious

Geometric ————●———————— Organic

Abstract —●———————————— Literal

Design inspiration

Design from 99designs   Design from 99designs   Design from 99designs

Design from 99designs   Design from 99designs   Design from 99designs

Design from 99designs   Design from 99designs   Design from 99designs

Design from 99designs

⬇ Download all files

References

Attachments

Parentull by Edward Cru...   Parentull Presentation.pdf   Parentull FSD 2017 007...
19 minutes ago · 312.5KB   19 minutes ago · 585.73KB   19 minutes ago · 1.77MB

⬇ Download all files

Other notes
Unspecified

Contest deliverables

Ⓐ Logo   ⬇ Download template

Final files

Layered vectors

AI   EPS

Screen quality

PNG   JPG   PDF

Fonts

If you use fonts that require a license, confirm with the client they're ok with it. For licensing reasons, it is better to provide your client with information on how to acquire the font rather than providing the actual files.

Text in logos should be converted to outlines.

Appendix F – Full page System Flow Diagram