ILSA Green Belt for Growth: Initial System Definition

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Project Overview

Stage	Objective	Tools
Define	Define project objective, approach, & metrics	Charter, TPM, FMEA
Measure	Understand users & their needs	Value chain, QRP
Analyze	Prioritize needs based on competition, constraints, & importance to users	Competitive radar, Decision matrix, QFD, Impact x Ease matrix
Innovate	Identify function subset with greatest impact	Conjoint Analysis, Input prioritization matrix
Control	Define process for evaluation of new functions	Control Plan

Define

Charter

D

	Choose the Value (Business Need, Project Objectives)	
Project Description	What process or product offering is to be improved or developed?	*Design a prototype for a new product offering of the Independent LifeStyle Assistant.*
Target Customer(s)	Who are the customer(s) that will benefit from this project (may also include internal customer)?	*NIST, HBC, Researchers/developers of phase II, (Distributors, End-Users)*
Customer Need – Problem Statement	What key problem do they need solved?	*R&D: Need to understand what to build* *NIST: Monitor (& see) program progress, Expand SOA & US industry* *HBC: Make money*
Competitive Alternatives	What are alternative or competitive solutions that need to be considered?	*HBC: Partnerships with existing point or other solutions* *R&D: Adhoc approaches to reasoning* *NIST: Other proposals; wait for market to self-propel*
Value Proposition (external) Project Justification (internal)	How will the customer benefit from using our offering? What are the project's expected financial and/or non-financial returns and when?	*HBC: New product offering. Sustainable, expandable.* *NIST: Design that integrates / stimulates other industries. Justify existence to Bush.* *R&D: Design that supports sustainable, realistic Testbed.* *Implementation based on the design will open a new market; and have cost-effective upgrades.*

	Provide the Value (Team, Budget, Schedule)			
Team Members	Who are the full-time members and any expert consultants?	*Whillock, Toms, Dewing, Haigh*		
Budget	What resources are available to the team?	*ILSA project funding. Up to $90,000*		
Empowerment	What decisions are the team empowered to make?	*We're the four leads to the project!*		
Schedule	Project start	*15 April 01*	Improve/Innovate completion	*13 July 01*
	Define completion	*18 May 01*	**C**ontrol completion	*20 July 01*
	Measure completion	*25 May 01*	Project completion	*30 July 01*
	Analyze completion	*6 July 01*		

	Communicate and Capture the Value (Project Deliverables)				
Project Closure	What are the key deliverables from the project?	*Design of ILSA Phase I prototype. (Features, Agents, Components, Devices & Infrastructure)*			
Project Measures	What metrics will demonstrate the improvement?	Metric	Baseline	Goal	Units
		Implementation Risk	*15.96*	*6*	*months*
		Avg Cust Pull	*5.33*	*7*	*Scale 1-9*
		Size of Featureset	*200*	*20*	*Num features*
		Decision Time	*Open*	*July 2001*	

Thought Process

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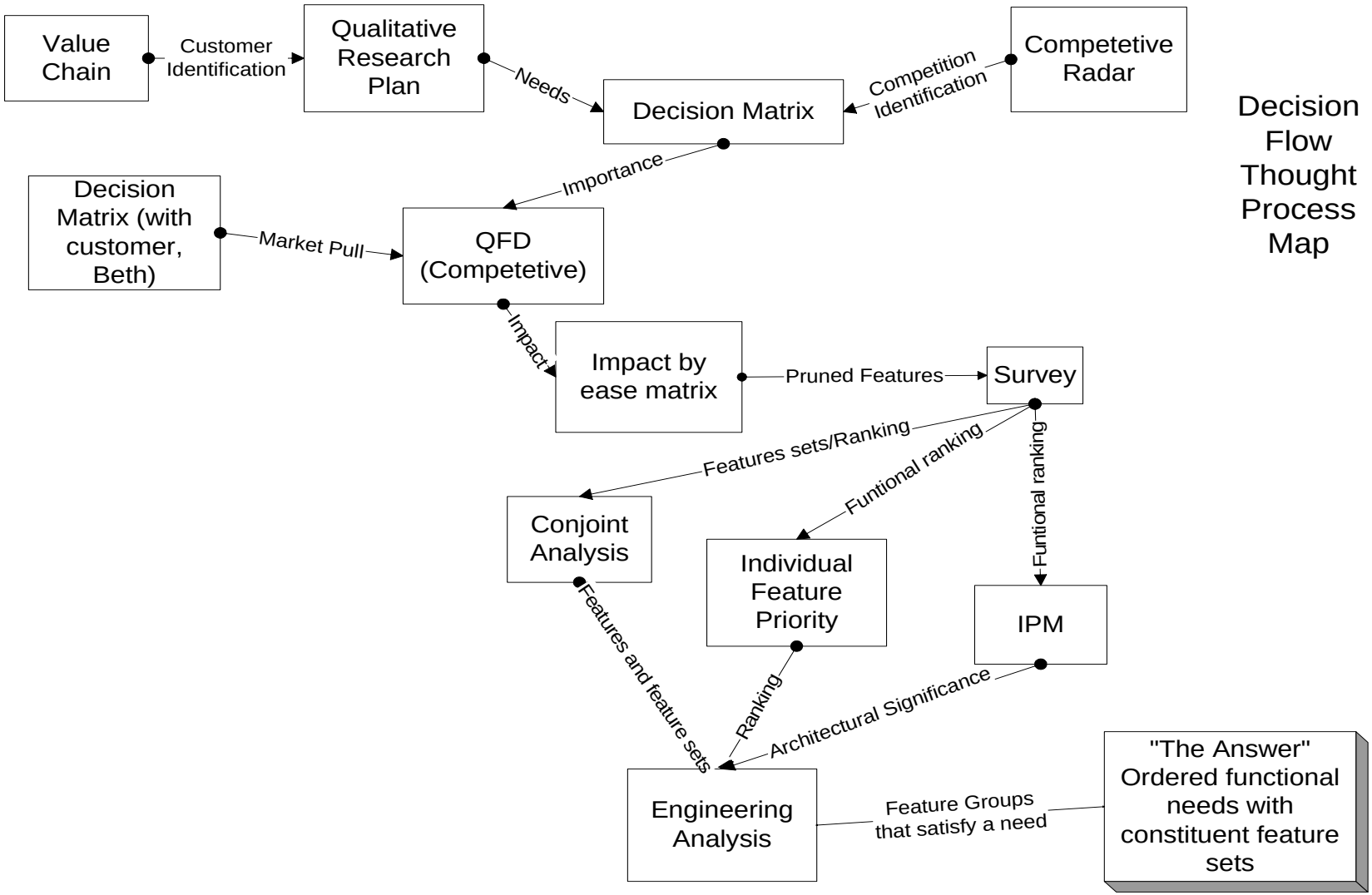

Decision Flow Thought Process Map

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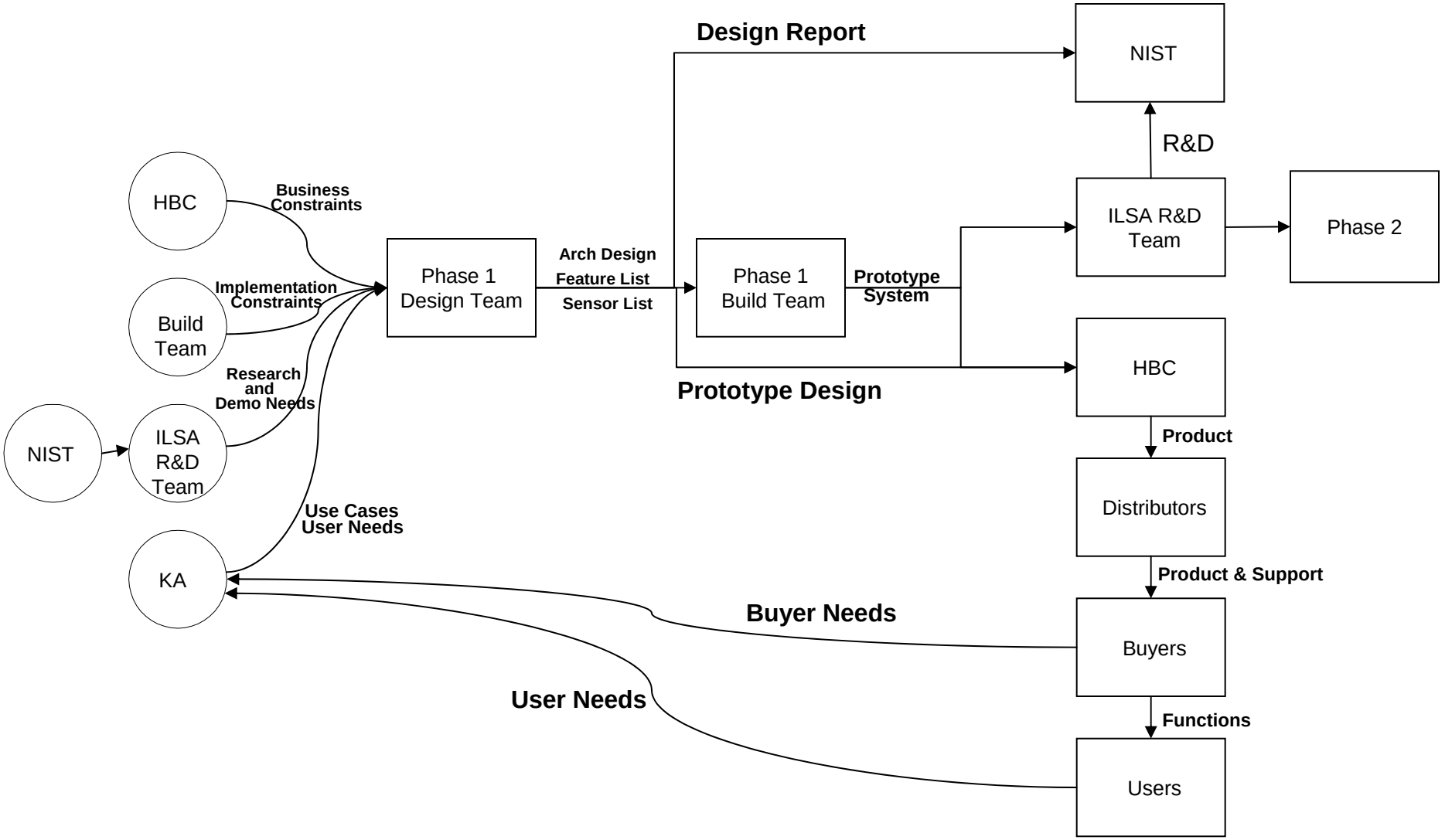
Strategic FMEA

Risk Category	Potential Failure Mode	Potential Failure Effects	SEV	Potential Causes	OCC	Controls	DET	RPN
Technical Approach	Can't handle processing needs	New architecture, new HW, weak demo	10	HOME-CARE needs grow, failure creep, no buyers	5	Communication, collaboration	5	250
Technical Approach	Not done in time	Delay demo	5	Missed parts of design, found hurdles late	7	Early full-path narrow test, PM tools	5	175
Competition	Inferior solution	Customers not satisfied	5	Competing system moves fast	5	Work with standards, watch field, be nimble	5	125
H&BC	HBC drops business. Jack Welch strikes project	No support to build demos, loss of credibility, no partners	10	Outside effects	3	Close working with SBU	3	90
Legal	Security concerns not handled	No-one will use, credibility lost	3	Hacker breaks our system, we miss it	3	Expose our security to critical review	10	90
Technical Approach	promising to be everything for everyone	fail to meet expectations	5	need to sell program; open architecture concept implies large range of functionality; lack of focus	4	rigorous functional analysis; rigorous PRS adherence process	4	80
Technical Approach	Unable to develop alg	Severely reduced or crippled functionality	6	Not enabling personnel, poor choice of personnel	6	PM tools	2	72
Technical Approach	Can't accommodate needed HW	Miss part of demo	7	Bad communications, falure in drivers	3	Early full-path limited test	3	63
customers	high cost	not enough customers	5	complexity	3	requirements, seek low cost solution first	3	45
Technical Approach	Change in compute platforms difficult to follow	Lack of acceptance, delays	3	Inflexible design, too focused on demo	5	Reviews by customers	3	45
Technical team	Overcommitment to other projects	Shortage of personnel, Nothing built	7	Lack of direction, lack of interest	6	PM tools		42
H&BC	no personnel	inability to transfer technology, productize; inability to establish good requirements; have to start over because they get involved late and want concept redefined	5	management commitment, focus on cost cutting, near term results, business climate, making the numbers; perception of what it takes to succeed	4	we provide engineering, d arket a ces; supp nd-t buy-in of the c t outsou	2	40
Technical team	Committee meetings	Missed deadlines	5	Consensus decision-making, poor leadership	8	PM		40
Technical team	Shortage of personnel	Nothing built	5	Overcommitment to other projects	8	PM tools		40
legal	liability - system fails to alert condition when needed	decide not to offer; cripple functionality; added complexity	5	litigious society	3	partner may be ore famil r with these issues; p sition in the market to make limited role clear; introduce into supported setting; disclaimers	2	30

Top 15 of 50

Measure

Value Chain


Design Report
NIST
R&D
HBC
Business Constraints
Implementation Constraints
Research and Demo Needs
Build Team
NIST
ILSA R&D Team
Phase 1 Design Team
Arch Design
Feature List
Sensor List
Phase 1 Build Team
Prototype System
ILSA R&D Team
Phase 2
HBC
Prototype Design
Product
Distributors
Product & Support
Use Cases
User Needs
KA
Buyer Needs
Buyers
User Needs
Functions
Users

M Qualitative Research Plan

BUSINESS OBJECTIVE

Given the changing demographics of the American population – the proportion of elderly Americans is significantly increasing – create a new market for Honeywell home automation products.

POTENTIAL OFFERINGS

Develop new home-care technology to support elder independence from within the home; develop new home-care technology to support caregiving activities from outside the home.

RESEARCH OBJECTIVE

Determine the needs of elders to maintain independent living; determine the needs of caregivers to provide efficient, quality care that facilitates elders' independent living.

WHAT INFORMATION IS NEEDED?	WHO WOULD YOU LIKE TO TALK TO?
• Precipitating factors for institutionalization	(1) seek answers in existing literature; (2) speak with geriatric/gerontology specialists
• Nature of elder-caregiver interactions	(1) informal caregivers; (2) formal caregivers
• Activity assistance needs of elders	(1) geriatric/gerontology specialists; (2) informal caregivers; (3) formal caregivers
• Activity assistance needs of caregivers	(1) informal caregivers; (2) formal caregivers; (3) geriatric/gerontology specialists

DATA COLLECTION PLAN

Population: Elders age 65 or higher who receive in-home care from formal and/or informal caregivers on a weekly basis; individuals between 18 and 70 who provide in-home care to an elder on a weekly basis; individuals between 18 and 60 who have education and practical experience in the fields of geriatrics or gerontology
Sampling: A convenience sample will be used to identify approximately 10 elders, 10 caregivers, and 3 specialists
Procedures: One-on-one interviews will be administered using a combination of the perception and mental process interview guides
Data Collectors: Human Factors professionals trained in methods of collecting data from human participants
Timing: Data will be collected over a period of 6 weeks at the outset of the project
Cost: Equivalent to approximately 6 full-time weeks for 1 individual

ANALYSIS PLAN

Determine relative importance of needs identified for both elders and caregivers. Importance will be quantified through frequency of occurrence from all sources. Expert opinion will be used to determine ultimate ranking of importance for identified needs.

QRP Results

M

User Needs Identified from QRP

High

Safety
Medical monitoring
Mobility
Caregiver Burnout
Medication Management
Dementia
Eating
Transportation
Isolation
Managing Money

Medium

Toileting

Low

Housework
Shopping Assistance
Pressure Sores
Using Equipment
Alcohol Abuse
Wandering
Hallucinations & Delusions

QRP Results

Example of High-Level Need: Isolation

Isolation **Level 1**

- Isolation and lack of social contact has implications on many different aspects of elderly life.
- Isolation is associated with increased vulnerability to solicitations, con artists, and other predators.
- Healing time and recovery success are positively impacted by social interaction. Social support at times of injury is strongly correlated with the success of recovery, and lack of support is related to increased institutionalization. [Tibbitts]
- Isolation can lead to depression and associated changes in behavior such as alcohol abuse, reduced appetite, reduced activity level, and increased functional decline.

Assistance Needs	Technology Opportunities
▪ Encourage and facilitate socialization	▪ Provide regular interaction with the care recipient via means that are normally associated with guests, friends, family, etc. (e.g., phone calls and emails) ▪ Provide social interaction such as "reading" to care recipient (i.e., playing books on tape) ▪ Facilitate ways in which care recipients can continue to get social contact from external sources like video phone interaction with doctors, calling in a daily/weekly shopping list to a human, ordering supplies via phone rather than web, etc. ▪ Create an ILSA community in which all ILSA users can interact with one another via the web, video gatherings, phone.

Sources

Kathy Krichbaum and Nancy Williams. Interviews with family caregivers.

Tibbitts. (1996). Patients who fall: How to predict and prevent injuries. Geriatrics, 51 (9).

Analyze

A Needs Decision Matrix

Purpose: Determine the importance factor for each assistance need in order to pare down list and to carry over to QFD planning ex

Inputs: Interview results from the qualitative market research plan

Outputs: Prioritized list of needs based on customer importance and importance factor for QFD analysis

	Criteria					
Assistance Needs	**prevalence in source material**	**contribution to institutionalization**	**impact on caregiving resources**	**limitation on functionality**	**Average**	
alcohol use	1	1	1	3	1.5	
caregiver burnout	9	9	9	3	7.5	*
dementia	9	9	3	3	6.0	*
eating	9	3	9	3	6.0	*
equipment use	1	1	3	3	2.0	
hallucinations	1	3	3	1	2.0	
housekeeping	3	1	9	1	3.5	
toileting	3	9	9	3	6.0	*
isolation	9	3	1	9	5.5	*
medical monitoring	9	9	9	9	9.0	*
medication mgmt	9	9	9	3	7.5	*
mobility	9	3	9	9	7.5	*
money mgmt	9	1	3	1	3.5	
pressure sores	1	1	1	1	1.0	
safety	9	9	3	3	6.0	*
shopping	3	1	9	1	3.5	
transportation	9	1	9	3	5.5	
wandering	1	9	3	1	3.5	*
Usability	3	3	3	3	3.0	*

Competitive Radar

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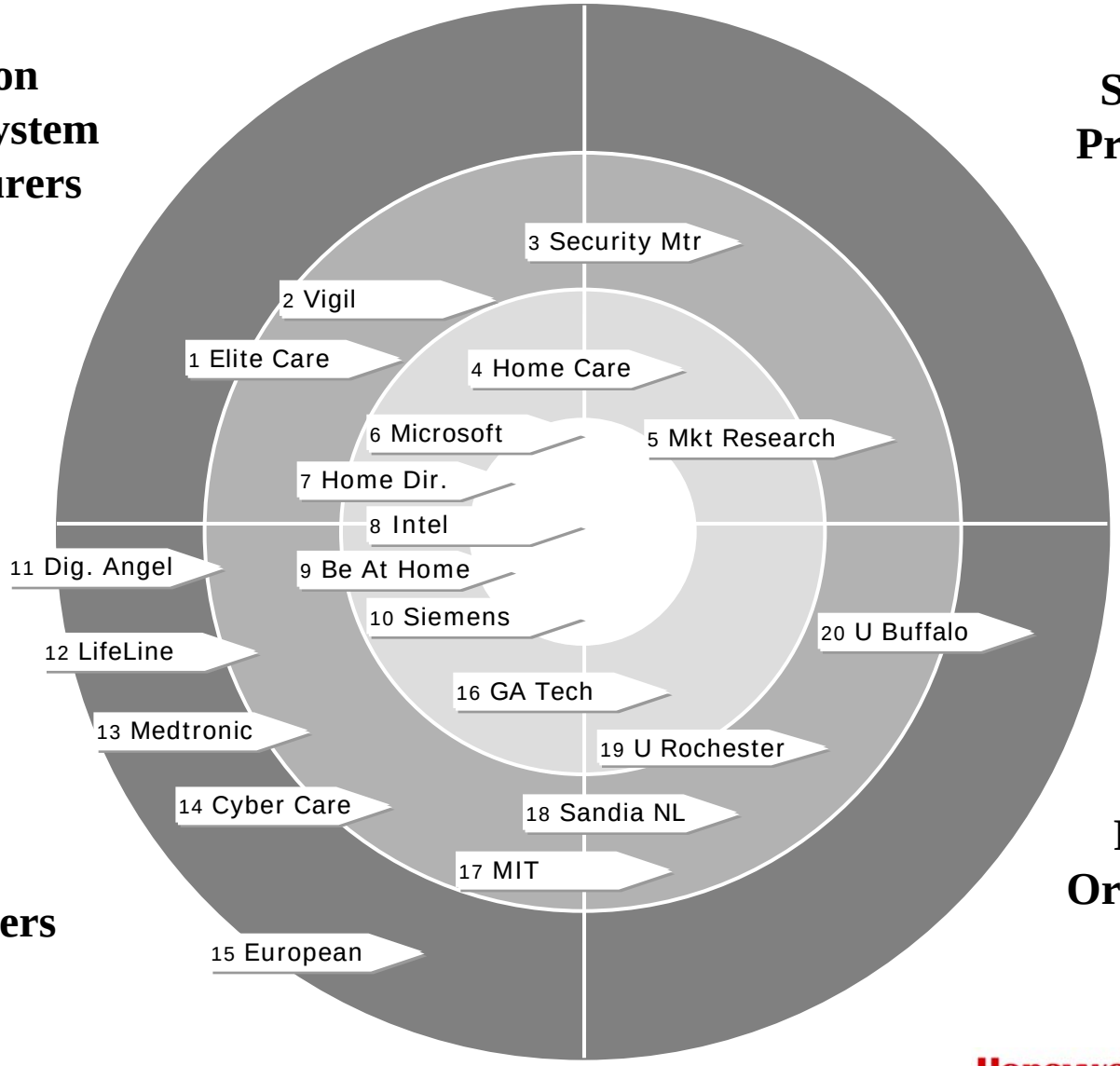
Institution Device & System Manufacturers

Service Providers



Direct Competition

Indirect Competition

Remote Competition

Future Competition

Home Device & System Manufacturers

Research Organizations

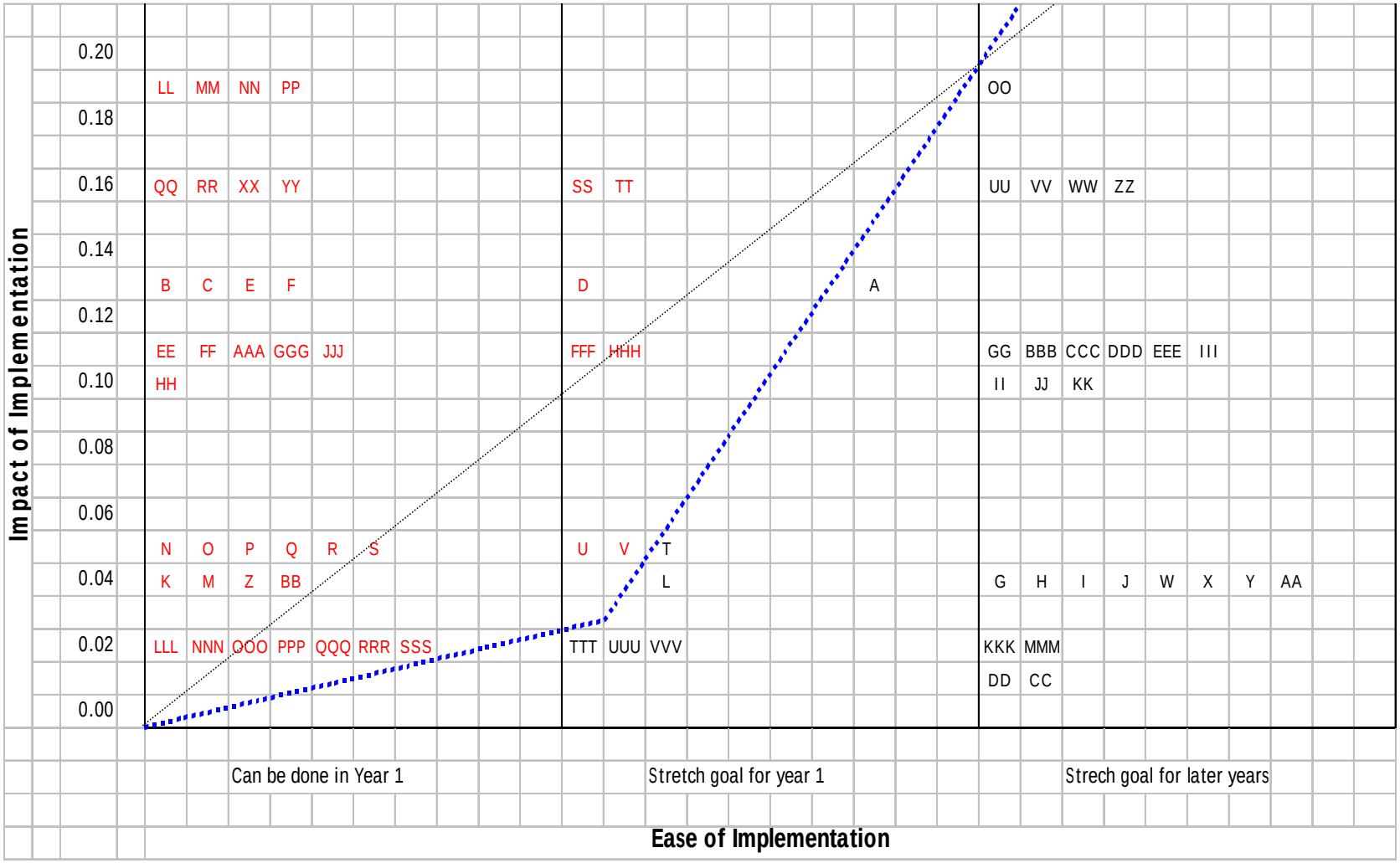
Competitive QFD

A

Customer Needs	Importance	Our CurrentPerformance	Competitor Performance								Performance Goal	Improvement Required	Impact of Improved Perf.	Development Priority
			EasyLiving	Aware Home	Intelligent Home	Vigil	Elite Care	Lifeline	CyberCare	Be At Home				
alcohol use	1.5	0	0	0	0	0	0	0	0	0	0	0	0.8	0
caregiver burnout	7.5	0	0	1	1	9	9	0	1	3	9	9	0.8	54
dementia	6	0	0	3	0	3	3	0	0	0	3	3	0.95	17
eating	6	0	1	1	1	0	3	0	1	0	3	3	0.8	14
equipment use	2	1	1	3	0	0	0	0	3	0	3	2	0.95	4
hallucinations	2	0	0	0	0	0	0	0	0	0	0	0	0.8	0
housekeeping	3.5	0	1	1	1	0	0	0	0	0	1	1	0.8	3
toileting	6	0	0	1	1	9	3	0	0	0	9	9	0.8	43
isolation	5.5	0	0	1	0	0	3	0	9	1	9	9	0.8	40
medical monitoring	9	0	0	1	1	0	3	0	9	0	9	9	0.95	77
medication mgmt	7.5	0	0	1	1	0	0	0	3	0	3	3	0.95	21
mobility	7.5	0	1	3	1	0	9	0	0	0	9	9	0.95	64
money mgmt	3.5	0	0	1	1	0	0	0	0	0	1	1	0.8	3
pressure sores	1	0	0	0	0	0	0	0	0	0	0	0	0.8	0
safety	6	3	0	3	1	0	3	9	3	3	9	6	1.2	43
shopping	3.5	0	0	1	1	0	0	0	0	0	1	1	0.8	3
transportation	5.5	0	0	1	1	0	0	0	0	0	1	1	0.8	4
wandering	3.5	0	0	0	0	0	3	0	0	0	3	3	0.95	10
usability	3	1	1	1	0	3	3	3	3	3	3	2	1.2	7
Weighted Overall Performance		23	22	125	65.5	148.5	270	63	199.5	55	473.5			408

Impact x Ease Matrix

A



Impact x Ease Matrix

A

A	Resource guide	Burnout
B	To-do lists	
C	Reminders	
D	Routine instructions	
E	Remote access to information	
F	Coordinate multiple caregivers	
G	Monitor for presence/worsening of der	Dementia
H	Detect wandering	
I	Detect agitation	
J	Detect aggressive behavior	
K	Task reminders	
L	Task instructions	
M	Provide reassurance (is everthing	
N	Monitor medicine supply	Medication
O	Monitor medicine freshness	
P	Medicine reminders	
Q	Verify medication taken	
R	Alerts to elders/caregivers	
S	Notifications to elders/caregivers	
T	Monitor for Adverse Drug Reactions	
U	Auto contact emergency personne	
V	Reduce false alarms	
W	Monitor grocery needs	Eating
X	Monitor grocery freshness	
Y	Auto generate grocery list	
Z	Detect eating/lack of	
AA	Facilitate on-line ordering	
BB	Monitor appliance use	

CC	Edler-friendly hardware designs	Equip
DD	Device interaction cues/instructions	
EE	Detect toileting/lack of	Toilet
FF	Path lighting	
GG	Dectect incontinence, dehydration, etc.	
HH	Provide real-time 2-way coms	Isolation
II	Provide storey telling	
JJ	Provide games	
KK	Provide ILSA web-community	
LL	Monitor & store vital signs	Medical
MM	Detect anonolous med. conditions	
NN	Reading/equipment reminders	
OO	Communicate with 3rd party devices	
PP	Facilitate medical data input by elder	
QQ	Detect mobility/lack of	Mobility
RR	Detect home or away	
SS	Detect number of people in home	
TT	Detect location of people in home	
UU	Track location of people outside home	
VV	Obstacle detection	
WW	Obstacle avoidance	
XX	Detect falls	
YY	Monitor general activity level	
ZZ	Distinguish people	

AAA	Monitor environment	Safety
BBB	Provide evacuation plan/instructions	
CCC	Monitor appliances	
DDD	Monitor power supply to house	
EEE	Monitor/control water temperature	
FFF	Home maintenance reminders	
GGG	Respond to panic button	
HHH	Poll elder for status/needs	
III	Auto control devices post-event	
JJJ	Intrusion detection	
KKK	Detect wandering	Wanderi
LLL	Detect enter/leave house	
MMM	Deter exit from home	
NNN	Operational modes	Usability
OOO	Password-free elder interactions	
PPP	To-do list filtering	
QQQ	Intelligent reminding	
RRR	Acknowledge with exceptions	
SSS	Function muting	
TTT	Sensor muting	
UUU	Query dialog	
VVV	UIN	
WWW		
XXX		
YYY		
ZZZ		

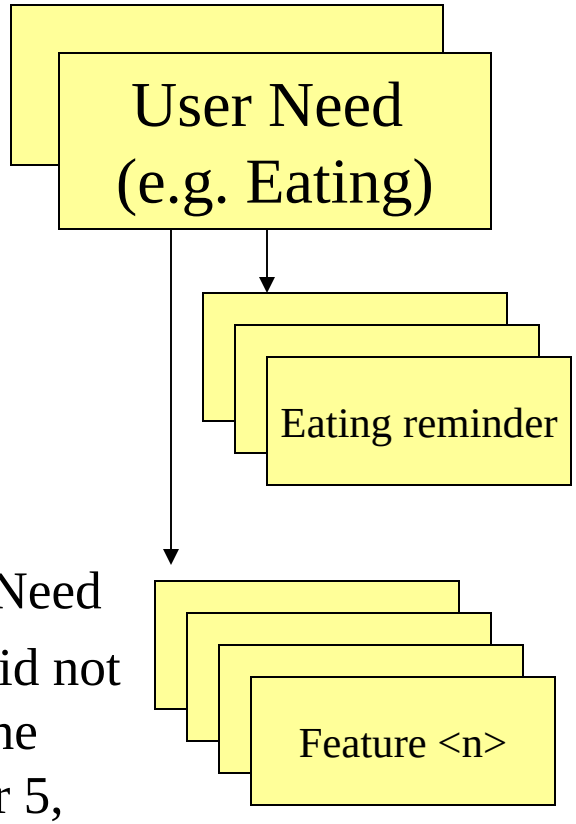
Selected feature

Eliminated feature

Innovate

Conjoint Analysis

- Objective
  - Determine minimum number of features, *considered together*, that satisfy a User Need
- Surveyed development team
  - Rate (from 1 to 10) how well various feature groupings meet a defined User Need
  - 10 User Needs (eating, mobility, safety, etc.) presented with up to 7 feature groupings per Need
  - Grouping with highest numerical score that did not include all features was chosen to represent the best tradeoff. If no grouping had a score over 5, the full feature group was used
  - The union of the feature groups from the top 5 User Needs was used as the base feature set for the system.



Conjoint Analysis

Conjoint Example: Eating

		Combo1	Combo2	Combo3	Combo4	Combo5	Combo6	Combo7	
Scores	Survey 1	2	2	3	4	3	3	6	
	Survey 2	3	2	3	4	3	3	6	
	Survey 3	3	4	4	5	4	4	5	
	Survey 4	3	3	4	5	4	4	6	
	Survey 5	2	1	3	4	7	6	5	
	Survey 6	7	6	8	8	9	8	10	
	Survey 7	3	4	6	9	8	8	10	
	Survey 8	5	6	6	8	9	8	10	
	Survey 9	5	2	5	6	6	6	7	
	Survey 10	5	6	6	7	6	6	6	
	Survey 11	5	4	5	6	8	7	8	
	Survey 12	3	2	4	6	4	4	6	
	Survey 13	4	4	6	8	8	8	10	
	Survey 14	5	6	6	8	6	6	8	
	Average	3.93	3.71	4.93	6.29	6.07	5.79	7.36	
Feature In Combo?	detect eating/lack of	1		1	1	1	1	1	
	facilitate on-line ordering				1			1	
	eating reminders					1		1	
	alerts to elders/caregivers	1	1	1	1	1	1	1	
	UINs	1	1	1	1	1	1	1	
	auto-contact 911	1	1	1	1	1	1	1	
	supplement EMS info						1	1	
	monitor appliance use		1	1	1	1	1	1	
Percentage of scored	detect eating/lack of	0.25	0.00	0.20	0.17	0.17	0.17	0.13	0.844
	facilitate on-line ordering	0.00	0.00	0.00	0.17	0.00	0.00	0.13	0.281
	eating reminders	0.00	0.00	0.00	0.00	0.17	0.00	0.13	0.276
	alerts to elders/caregivers	0.25	0.25	0.20	0.17	0.17	0.17	0.13	0.977
	UINs	0.25	0.25	0.20	0.17	0.17	0.17	0.13	0.977
	auto-contact 911	0.25	0.25	0.20	0.17	0.17	0.17	0.13	0.977
	supplement EMS info	0.00	0.00	0.00	0.00	0.00	0.17	0.13	0.269
	monitor appliance use	0.00	0.25	0.20	0.17	0.17	0.17	0.13	0.837

Conjoint Analysis

Features from top 5 User Needs

- Monitor Environment
- Reminders
- Panic Button
- Alerts
- Reports
- Auto-contact help
- Intrusion detection
- Monitor & store vitals
- Trend vitals
- Detect anom. med. cond.
- Detect mobility
- Measure level of mobility
- Detect home and away
- Detect number of people
- Detect falls
- Reduce false alarms
- Verify medication taken
- To-do lists
- Remote access to information
- Coordinate multiple caregivers

……..*cut-off*…….

- Provide task instructions
- Provide reassurance
- Detect toileting
- Provide 2-way communications
- Detect enter/leave home
- Detect eating
- Monitor appliance use

I Validate Final Feature Set

Compare Development Priorities & Ratings

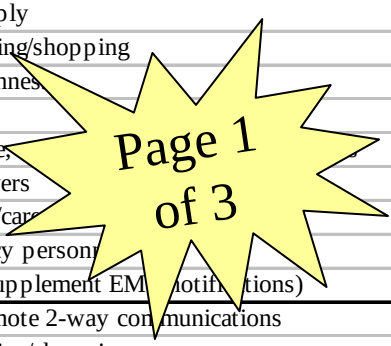
Function Development Priorities

Purpose: Display the priority of high level features based on (1) their survey score of contribution to the user need, (2) priority of the need.

Inputs: Functions list from Impact X Ease matrix; prioritization score from surveys; user need priorities from Competitive QFD

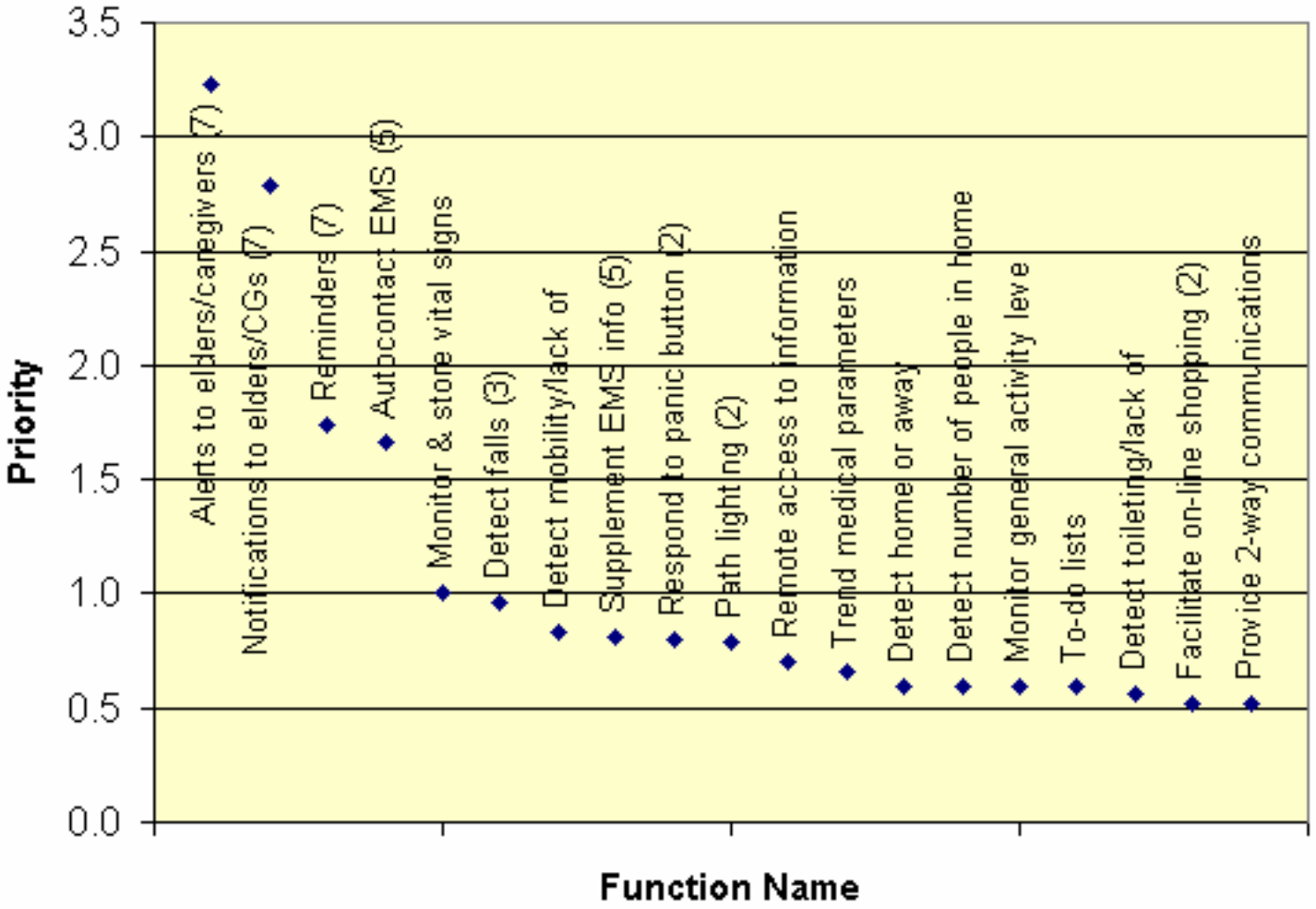
Outputs: Development priority score

Need			Features				
Need Priority	Normalized Priority	Need Name	Num	Survey Score	Normalized Score	Development Priority (Score * Need)	Feature
68	0.2099	burnout	1	1.530	0.845	0.177	To-do lists
	0.2099	burnout	2	1.197	0.661	0.139	Daily activity reminders (to client)
	0.2099	burnout	3	0.409	0.226	0.047	Daily activity instructions (to client)
	0.2099	burnout	4	1.811	1.000	0.210	Remote access to information
	0.2099	burnout	5	0.758	0.419	0.088	Coordinate efforts of multiple caregivers
54	0.1667	dementia	6	1.718	1.000	0.167	Daily activity reminders (to client)
	0.1667	dementia	7	1.605	0.934	0.156	Daily activity instructions (to client)
	0.1667	dementia	8	1.069	0.622	0.104	Provide reassurance (EverWatch - is everthing OK?)
68	0.2099	med mgmt	13	0.889	0.826	0.173	Monitor medicine supply
	0.2099	med mgmt	14	0.294	0.273	0.057	Facilitate on-line ordering/shopping
	0.2099	med mgmt	15	0.327	0.304	0.064	Monitor medicine freshnes
	0.2099	med mgmt	16	1.059	0.984	0.206	Medicine reminders
	0.2099	med mgmt	17	0.903	0.839	0.176	Verify medication type;
	0.2099	med mgmt	18	0.497	0.462	0.097	Alerts to elders/caregivers
	0.2099	med mgmt	19	1.076	1.000	0.210	Notifications to elders/car
	0.2099	med mgmt	20	0.655	0.609	0.128	Auto contact emergency person
	0.2099	med mgmt	21	0.294	0.273	0.057	Reduce false alarms (supplement EM notifi tions)
50	0.1543	isolation	35	3.274	1.000	0.154	Provide meaningful remote 2-way com munications
	0.1543	isolation	36	2.488	0.760	0.117	Facilitate on-line ordering/shopping



Validate Final Feature Set

Development Priorities (redundant functions summed)

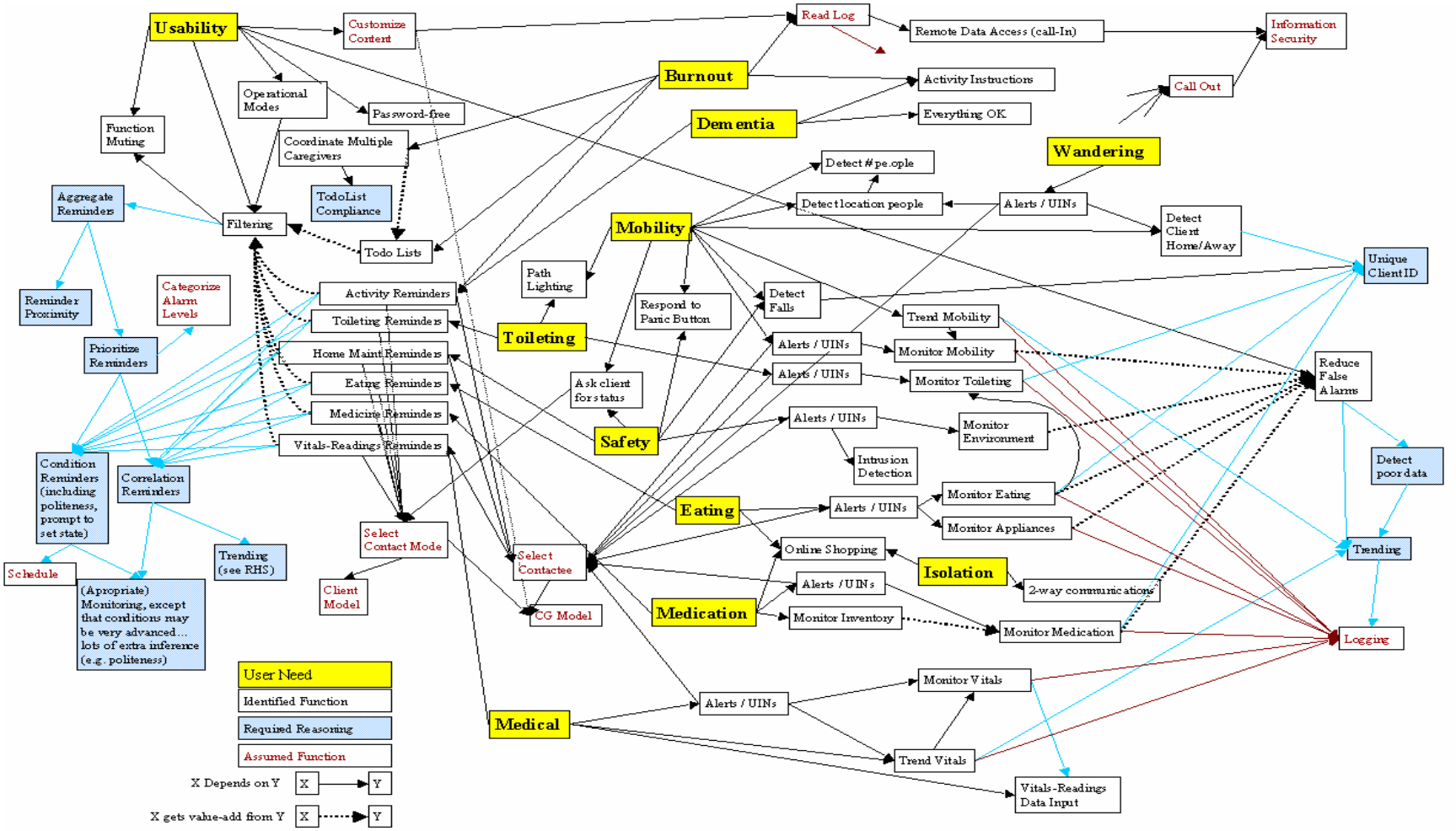


I Validate Final Feature Set

- Used Input Prioritization Matrix
  - To identify architectural significance of final feature set
- Determined value of feature
  - By crossing User Need priority x Feature Support of Need
- Built network of reasoning requirements for each feature
  - Propagated feature value across network (summing for redundant reasoning modules)
- Determined architectural significance
  - By identifying the highest value reasoning modules
- Found very close match between architecturally significant elements and final feature set elements

I Validate Final Feature Set

Input Prioritization Network



Final Feature Set

- Monitor Environment
- Reminders*
- Panic Button
- Alerts
- Reports
- Auto-contact help
- Intrusion detection
- Detect mobility
- Level of mobility*
- Detect home and away*
- Detect falls*
- Reduce false alarms*
- Verify medication taken*
- To-do lists*
- Remote access to information
- Coordinate multiple caregivers*

……

- Detect toileting*

……

- Path Lighting*
- Acknowledge with exceptions
- Operational modes
- Muting
- Password-free elder interactions

* Limited reasoning, low end of capability scale.

I Measure Outcome

A	Resource guide	Burnout	CC	Edler-friendly hardware designs	Equip	**AAA**	**Monitor environment**	Safety
B	**To-do lists**		DD	Device interaction cues/instructions		BBB	Provide evacuation plan/instructions	
C	**Reminders**		**EE**	**Detect toileting / lack of**	Toilet	CCC	Monitor appliances	
D	Routine instructions		**FF**	**Path lighting**		DDD	Monitor power supply to house	
E	**Remote access to information**		GG	Dectect incontinence, dehydration, etc.		EEE	Monitor/control water temperature	
F	**Coordinate multiple caregivers**		HH	Provide real-time 2-way coms	Isolation	FFF	Home maintenance reminders	
G	Monitor for presence/worsening of der	Dementia	II	Provide storey telling		**GGG**	**Respond to panic button**	
H	Detect wandering		JJ	Provide games		HHH	Poll elder for status/needs	
I	Detect agitation		KK	Provide ILSA web-community		III	Auto control devices post-event	
J	Detect aggressive behavior		LL	Monitor & store vital signs	Medical	**JJJ**	**Intrusion detection**	
K	Task reminders		MM	Detect anonolous med. conditions		KKK	Detect wandering	Wanderi
L	Task instructions		NN	Reading/equipment reminders		LLL	Detect enter/leave house	
M	Provide reassurance (is everthing OK?		OO	Communicate with 3rd party devices		MMM	Deter exit from home	
N	Monitor medicine supply	Medication	PP	Facilitate medical data input by elder		**NNN**	**Operational modes**	Usability
O	Monitor medicine freshness		**QQ**	**Detect mobility / lack of**	Mobility	**OOO**	**Password-free elder interactions**	
P	Medicine reminders		**RR**	**Detect home or away**		PPP	To-do list filtering	
Q	**Verify medication taken**		SS	Detect number of people in home		QQQ	Intelligent reminding	
R	**Alerts to elders / caregivers**		TT	Detect location of people in home		**RRR**	**Acknowledge with exceptions**	
S	**Notifications to elders / caregivers**		UU	Track location of people outside home		**SSS**	**Function muting**	
T	Monitor for Adverse Drug Reactions		VV	Obstacle detection		TTT	Sensor muting	
U	**Auto contact emergency personne**		WW	Obstacle avoidance		UUU	Query dialog	
V	**Reduce false alarms**		**XX**	**Detect falls**		VVV	UIN	
W	Monitor grocery needs	Eating	**YY**	**Monitor general activity level**		WWW		
X	Monitor grocery freshness		ZZ	Distinguish people		XXX		
Y	Auto generate grocery list					YYY		
Z	Detect eating/lack of					ZZZ		
AA	Facilitate on-line ordering							
BB	Monitor appliance use							

Selected feature

Eliminated feature

Measure Outcome

I

Size of Feature Set

- Initial List: 200+
  - based on brain-storming, not user requests
  - different levels of abstraction
  - no relationships (redundancies) identified to leverage effort
- Intermediate Features: 74
  - pruned based on implementation risk
  - pruned based on broad customer need categories
  - redundant functions identified to reduce effort
- Selected Features: 22
  - based on user requests & impact on independence
  - consistent level of abstraction

Measure Outcome

I

Estimated cost savings of $300,000 by eliminating

- wasted efforts in development of low-value features
- rework to get back on track

	Risk -- Average Months to Implement	Customer Pull (1-9)	Number Of Features
Initial Feature List	15.96	5.33	200
Intermediate Feature List	11.28	7.16	74
Final Feature List	6.55	7.39	22

Control

Control Plan

C

- The prototype build is an iterative process
  - This project was used to select an intelligent starting place and to put tools in place to manage changes over time
- Individual tools will be rerun based on:
  - New Customer Data
  - New Sensor Availability
  - New Business Arrangements
  - Revised Function Descriptions

Control Plan

C

For Example - Feature addition process

- New Feature slot added to weekly core team meeting agenda
- Team leads bring new feature ideas to meeting
- Team discusses feature with customer and decides do-ability classification
  - near term
  - long term
  - out there
- If near or long term, then feature is run through tools to determine development priority and ultimate inclusion