Doctoral thesis:

*"The Self-directed Individual Investor and
Online Investing Platform Decision Support"*

FINDINGS & PRACTICAL IMPLICATIONS

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MOTIVATION: INDIVIDUAL INVESTOR PERFORMANCE
1.5 - 8% underperformance, depending of sample

AUTHOR	YEAR	REGION	UNDERPERFORMANCE	NOTES
Barber & Odean	2000	U.S.	**-1.5%**	Average passive investors
		U.S.	**-6.5%**	Most active investors
Grinblatt & Keloharju	2000	Finland	**Individuals lose to institutional investors**	
Barber & Odean	2001		**-2.0%**	Main driver: trading losses
Shu et al.	2004	Taiwan	**-8.0%**	
Andersson	2007	Sweden	**-6.5%**	Losses up to 8% depending on investing style
Goetzmann & Kumar	2008		**Undiversified investors lose more than 2.4% compared to diversified**	
Oh et al.	2008	South Korea	**"*consistent with Shu et al.*"**	Losses in range of 8%
Barber et al.	2009	Taiwan	**-3.8%**	Aggregate losses are 2% of national GDP
Linnainmaa	2010	Finland	**"*poor performance*"**	Unoptimal limit orders
Barber et al.	2011	Taiwan	**1% of traders make consistent profits**	
Barber et al.	2021	U.S.	**High buy volumes lead to -4.7% losses in 20 days**	

Barber and Odean, 2002 & 2013:

"A group of overperforming investors start underperforming when going online"

This study: QUALITATIVE RESEARCH APPROACH

- Direct access to investors (N=39)
- Semi-structured open-ended investor interviews (1-3 per investor)

SELF-DIRECTED INDIVIDUAL INVESTORS (39)

- **Excluded**: robo-advisors, discretionary accounts, automatic saving schemes

"SURVIVING" INVESTORS

- Min 5 years of investing experience (typical: over 10 years)

PORTFOLIOS ALLOWING VARIOUS STRATEGIES

- Min 50'000 € portfolio (typically 100 - 500 k€)

3 COUNTRIES IN 2 CONTINENTS: CH, USA, FIN

- Existing DIY investing culture, localised and international brokerage available

THEMATIC ANALYSIS

- **Coding with MaxQDA qualitative data analysis tool**

- **1: Open coding**

- **2: Predefined coding**
  – **Investing process**
  – **Behavioral finance**
  – **Decision-making**

Analysis approach by: Yin (2015), Myers (2009); influenced by Gioia (2013).
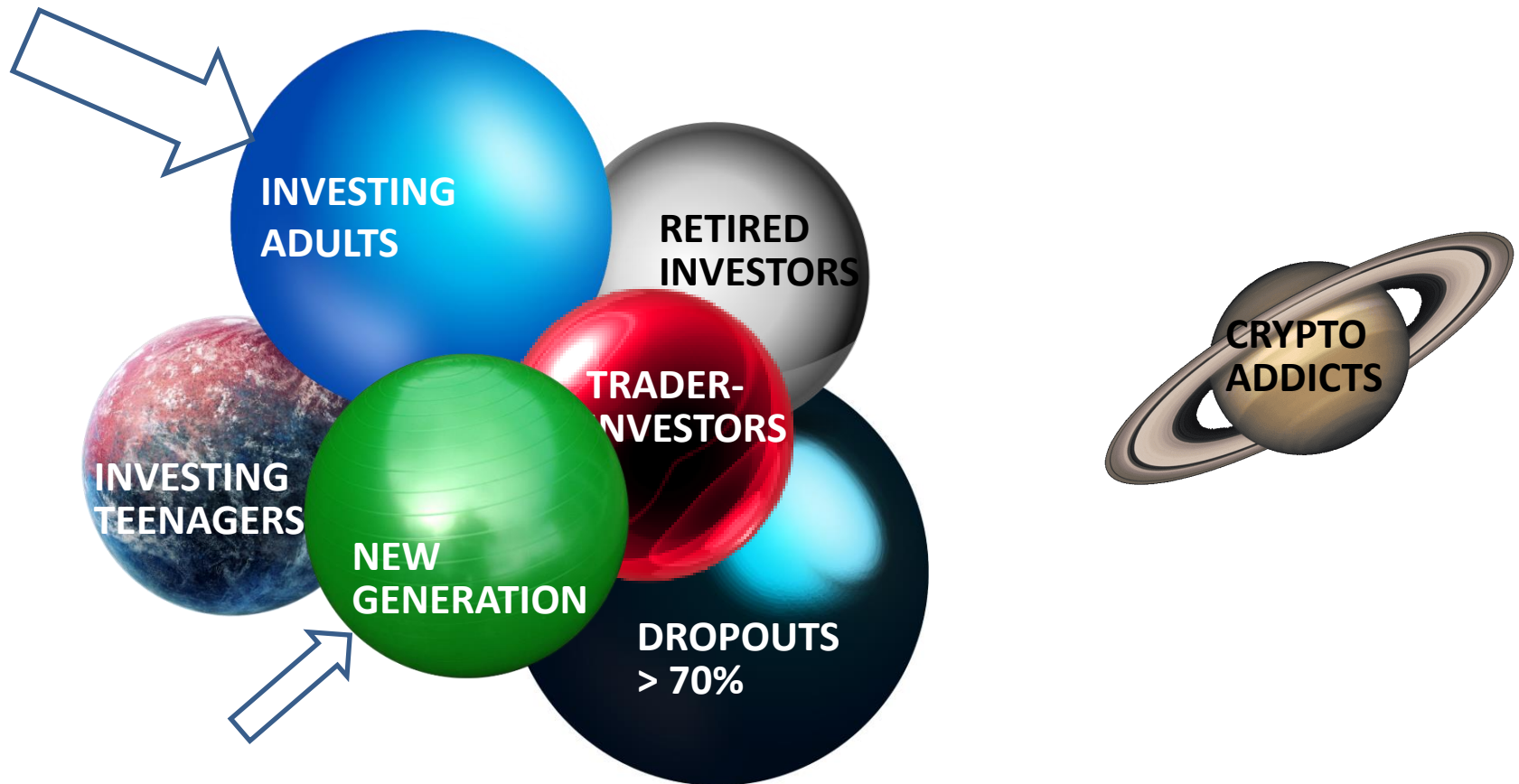
PART 1

Individual investor
decision-making patterns
Sample of 39 investors from USA, FIN, CH

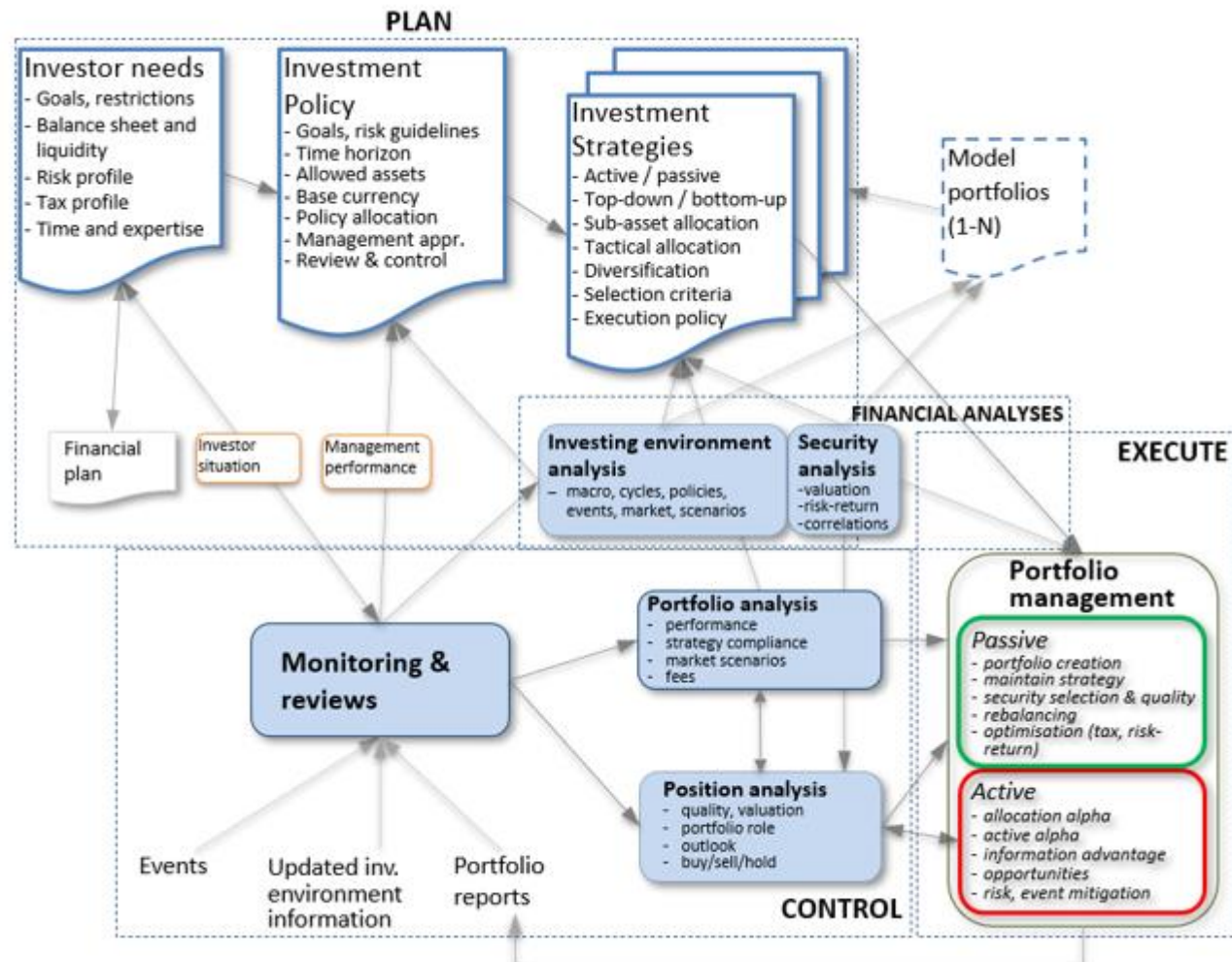# Investor segments dominating the sample:
Investing adults & New Generation

SYNTHESIS OF A GENERIC INVESTING PROCESS
- A REFERENCE FOR ANALYSES

Based on Sharpe 1987, Maginn 2007, Reilly 2012, Fabozzi 2002, Nevins 2004, Brunel 2015
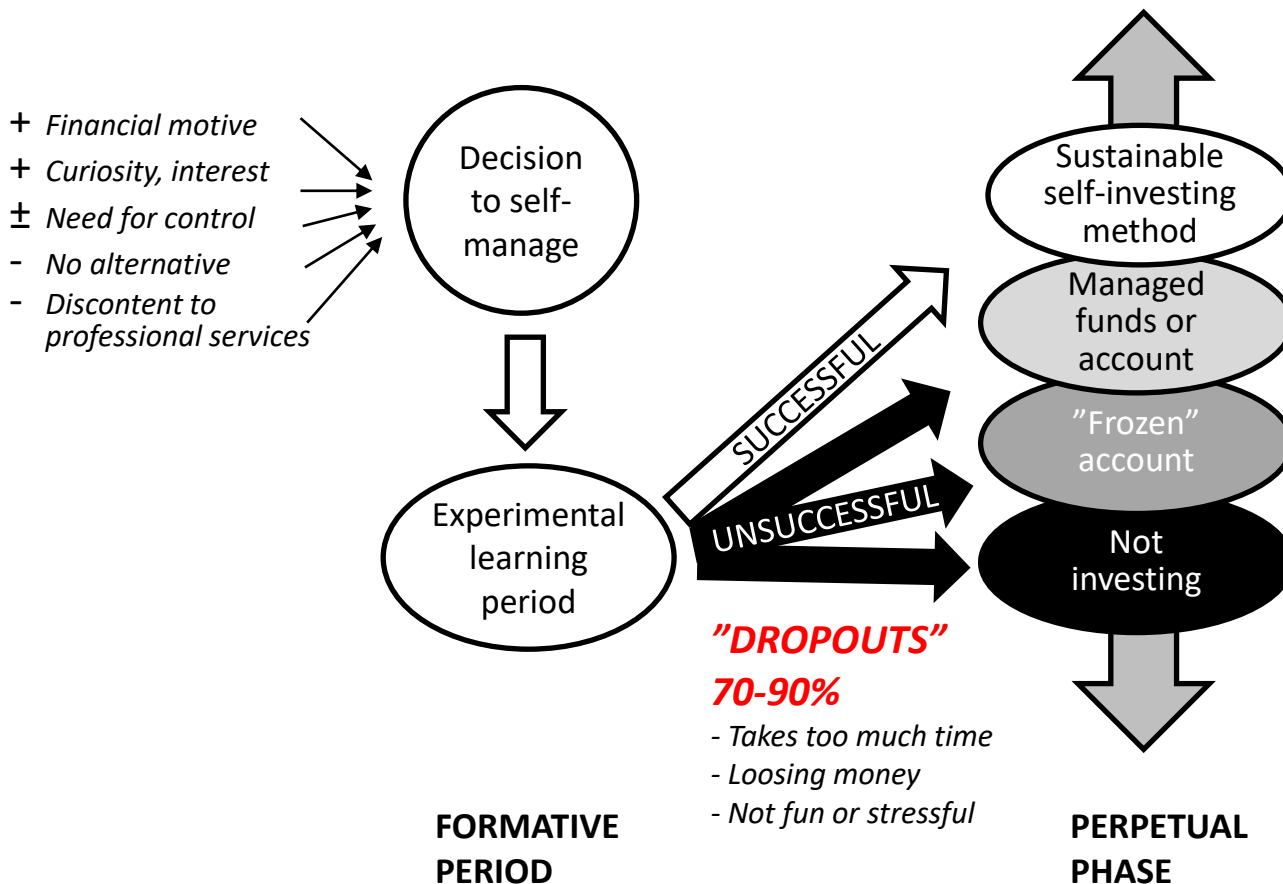+ proprietary private bank material

INVESTOR EXPERIENCE CYCLE

- "*Over 75% of online investors quit in 2 years*" (Barber, 2020)
- Survivors converge to sustainable investing style
=> Previous research has focused on failed investors

+ *Financial motive*
+ *Curiosity, interest*
± *Need for control*
- *No alternative*
- *Discontent to professional services*

Decision to self-manage

Experimental learning period

SUCCESSFUL

UNSUCCESSFUL

Sustainable self-investing method

Managed funds or account

"Frozen" account

Not investing

"DROPOUTS"
70-90%
- Takes too much time
- Loosing money
- Not fun or stressful

FORMATIVE PERIOD

PERPETUAL PHASE

DECISION **INCUBATION** instead of **IMPULSIVE** DECISION-MAKING

Profit-taking
SELL

Opportunity
BUY

Reallocate

Problem:
SELL/HOLD

No excess trading
as claimed by
quantitative research

D e c i s i o n

Favorite securities

EXPLICIT & IMPLICIT STRATEGY

INVESTING IDEA

Analyses, peers, stylized experts, seminars, forums

T r i g g e r

NEWS & ANALYSES
- economy
- policies
- industry
- events

MARKET
- valuation
- corrections
- sentiment
- outlook

ASSET PRICES
- valuations, mispricing
- surprise moves

COMPANIES
- outlook
- earnings
- recommendations

TIME
- have extra
- time is due

HINTS
- peers
- pundits

PERSONAL FINANCIALS
- liquidity needs
- unexpected life changes

PORTFOLIO
- reports
- alerts

Background
processes

**MONITORING ,
INFORMATION MINING,
SENSE-MAKING, LEARNING**

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FREQUENT LACK OF CLEAR FINANCIAL GOALS, STRONG MENTAL MOTIVES

Priority #1 (financial):
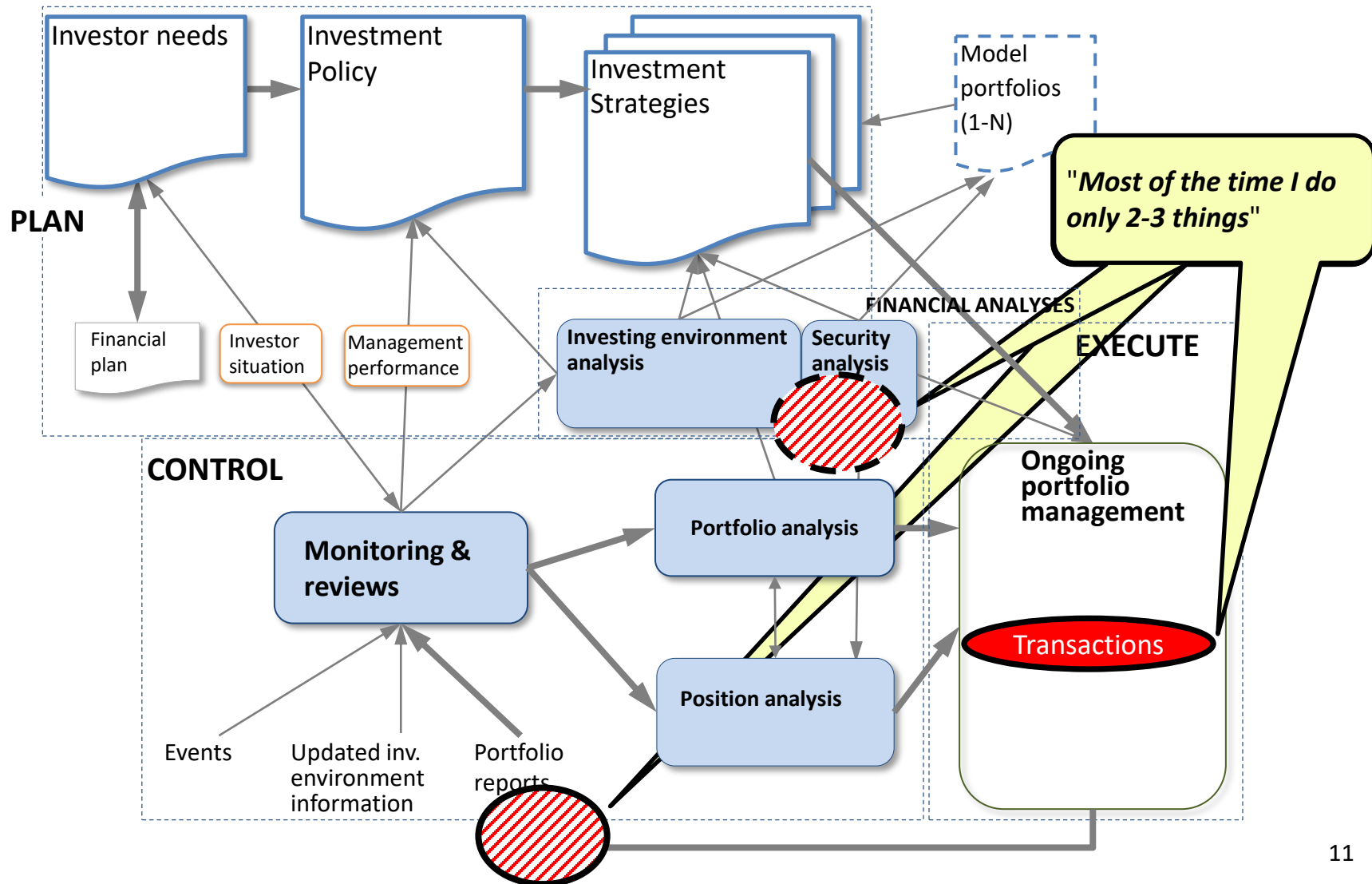**Conditional enhancement of future life-style**
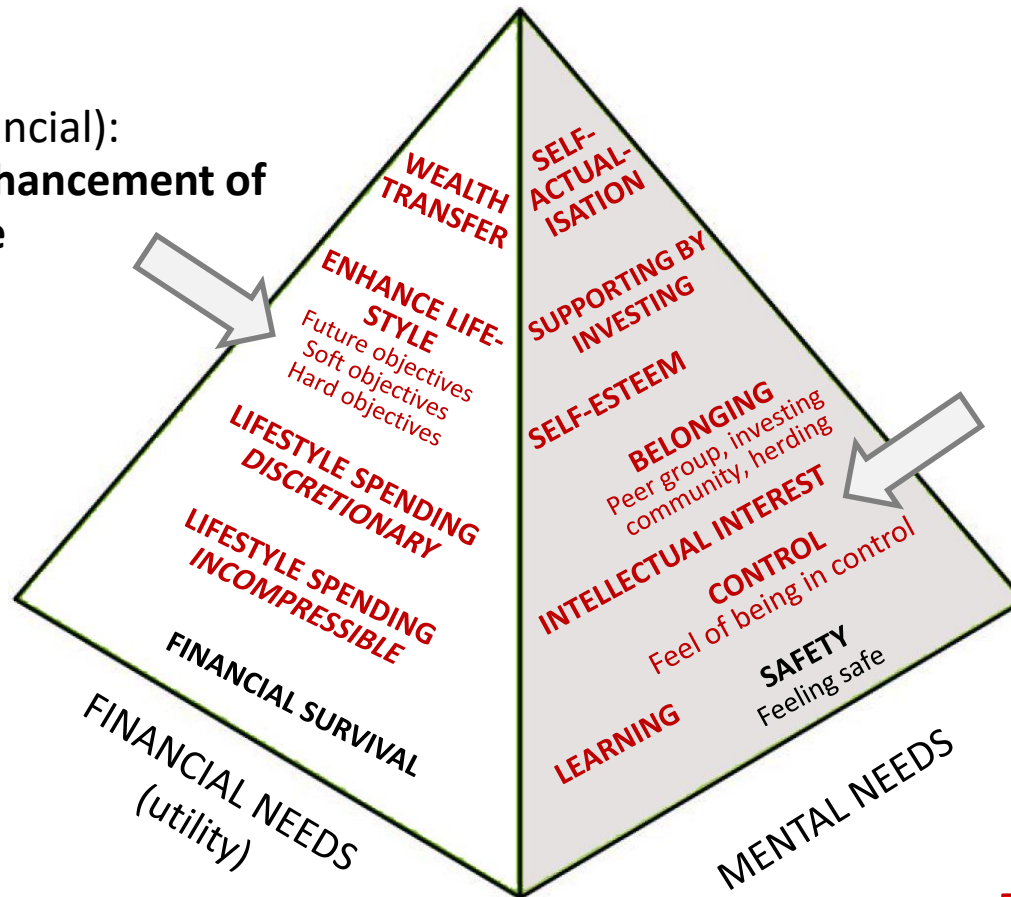
Priority #1 (mental):
Need for control and understanding

WEALTH TRANSFER

SELF-ACTUAL-ISATION

ENHANCE LIFE-STYLE
Future objectives
Soft objectives
Hard objectives

SUPPORTING BY INVESTING

SELF-ESTEEM

BELONGING
Peer group, investing community, herding

LIFESTYLE SPENDING DISCRETIONARY

LIFESTYLE SPENDING INCOMPRESSIBLE

INTELLECTUAL INTEREST

CONTROL
Feel of being in control

FINANCIAL SURVIVAL

SAFETY
Feeling safe

LEARNING

FINANCIAL NEEDS (utility)

MENTAL NEEDS

🟥 Interview support
⬛ Model suggestion
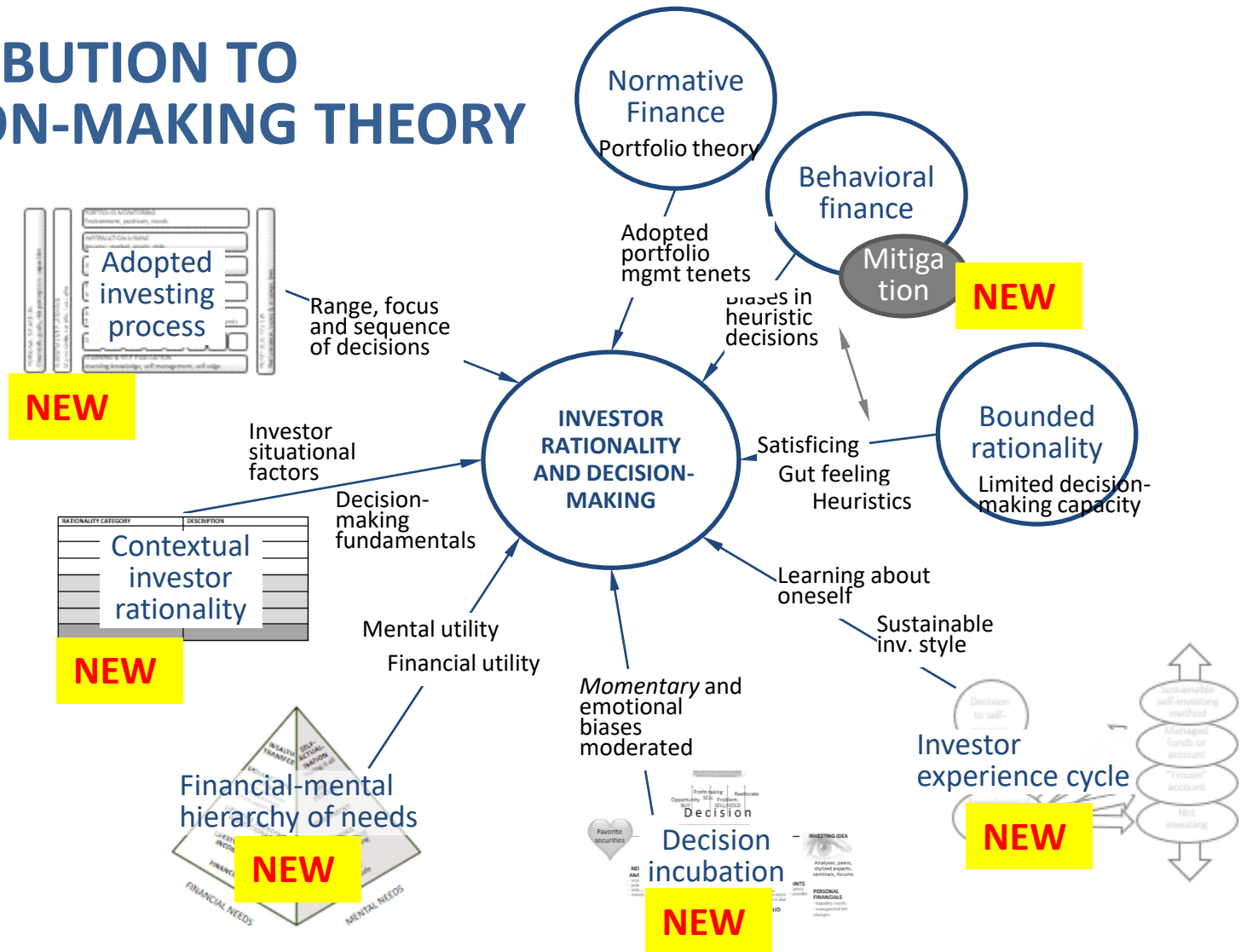
9

INVESTOR RATIONALITY REDEFINED
From theoretic "irrationality" to *7 shades of rationality*

ARGUABLE BEHAVIOUR:	Rational	Conditionally rational	Informed irrationality	Irrational with rationale	Agnostic irrationality	Forced irrationality	True irrationality
Skewed asset allocation	**Other wealth compensating the allocation**	A specific single goal portfolio	**Investing horizon justifies high risk allocation**		*Why would I buy bonds with negative yield and positive risk*	Cannot access all asset classes	Ignorance or negligence
Underdiversification		**Unique sectoral or other special knowledge**	*Underdiversification is compensated by better understanding the positions*	**I like to invest in direct stocks** **I have much better information of domestic markets** *Time will take care of it*	Quoting famous investors: **"People who don't know what they are doing, diversify"**	*I have no time to research many companies* *I cannot find many stocks matching my criteria*	*Why should I buy non-performing stocks to reduce volatility*
Not using index funds		Being able to reach an effective portfolio by other means	*The general market is overpriced*	I need to know what I own			***Index funds increase market volatility***
Stock-picking - heavy investing			Diversified portfolio, but informed "de-picking" Advantages in security analysis and information	Enjoying studying and following businesses *The funds hold anyway the same stocks*			Affect bias
Market timing	Time diversification	If proven sustainable success rate			*I have always believed in market timing*	**Need to exit the market due to a life event**	Overconfidence Risk volatility bias Panicking
Trading	Need for liquidity	Being better than 90% of pros		*I like trading*	Overconfidence		Gambling
Weak performance monitoring				Mitigation of behavioural bias *Are these people following their returns enjoying their lives?*		Returns are incorrect	
Not rebalancing	Taxation and high fees		Rebalancing not beneficial with few positions		Selling winners and buying more losers?	*Takes too much time*	Denial of cash mgmt needs for rebalancing
Missing portfolio level focus			Exceptional security picking skills	*I buy successful businesses, not portfolios*	Not experienced benefits of portfolio focus	Insufficient assets, employer options	Ignorance

PLATFORM PROVIDED DECISION SUPPORT IGNORED

PLAN

- Investor needs
- Investment Policy
- Investment Strategies
- Model portfolios (1-N)

Financial plan

Investor situation

Management performance

FINANCIAL ANALYSES

- Investing environment analysis
- Security analysis

EXECUTE

"*Most of the time I do only 2-3 things*"

CONTROL

Monitoring & reviews

Portfolio analysis

Position analysis

Ongoing portfolio management

Transactions

Events

Updated inv. environment information

Portfolio reports

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CONTRIBUTION TO DECISION-MAKING THEORY

Normative Finance
Portfolio theory

Behavioral finance

Mitigation

NEW

Adopted investing process

NEW

Adopted portfolio mgmt tenets

Range, focus and sequence of decisions

Biases in heuristic decisions

INVESTOR RATIONALITY AND DECISION-MAKING

Investor situational factors

Satisficing
Gut feeling
Heuristics

Bounded rationality

Limited decision-making capacity

Contextual investor rationality

Decision-making fundamentals

Learning about oneself

NEW

Mental utility
Financial utility

Sustainable inv. style

Financial-mental hierarchy of needs

NEW

Momentary and emotional biases moderated

Decision incubation

NEW

Investor experience cycle

NEW

FINDINGS < > PREVIOUS EMPIRICAL RESEARCH
- Excluding apprentices and traders change the outcome

	EXTANT RESEARCH	THE THESIS
Diversification	Underdiversification	Underdiversification CONFIRMED
Decision-making	~~Active, impulsive,~~ herding	Incubated
Investing horizon	~~Short~~	Buy & hold as the goal
Transactions	~~Excessive trading~~	"A few per year"
Biases	~~Overconfidence, illusion of control~~, disposition, affect, recency	*Mitigation of biases NEW: Tangibility bias*
Performance	Underperformance	*"Satisfactory minus"*
Investing process	N/A	Focus on information mining, stock-picking and reviews
Rationality	~~"Irrational"~~ ~~"No skills"~~	Contextually rational Debatable allocations

PROBLEMS IDENTIFIED IN PREVIOUS EMPIRICAL RESEARCH

- Transactions and portfolios studied instead of investors

- Purely mathematical analysis of investor behavior and decision making

- Flawed data: using trading data to analyse investors

- Flawed data: instead of investors, studying wannabe investors going to fail

- Flawed data: using students-only participants in experiments instead of investors

- Flawed methods: experiments using "monopoly money", investing period extremely short, no decision incubation

- Academic finance discipline focused on mathematical optimisations of portfolios. Decision-making discipline focusing on instant decision-making and biases

PART 2

Analysis of
online platforms

ONLINE PLATFORM SAMPLE

8 "Household" names in targeted countries

No single platform covers the whole investing process

Investing process

	1	2	3	4	5	6	7	8
INVESTMENT POLICY								
Investor profiling	X	X		X	X		X	
Financial planning		X		X			X	
Strategic asset allocation support	X	X		X			X	
International offering			X		X	X	X	X
INVESTING STRATEGY								
Multiple accounts	X	X		X	X	X	X	
Investing environment outlook	X	X	X	X	X	X	X	X
Asset class analyses	X	X					X	
Sector analyses and outlook	X	X	X	X		X	X	
Predefined strategies				X			X	
PORTFOLIO CREATION AND MANAGEMENT								
Virtual portfolios		X	X	X	X		X	
Model portfolios	X	X		X			X	X
Portfolio planner	X	X		X				
Security screening	X	X	X	X		X	X	
Security analyses	X	X	X	X		X	X	X
Portfolio optimizer			X		X			
What-if scenario tool				X				
Rebalancing		X	X					
Allocation enforcement	X		X					
PORTFOLIO ANALYSIS								
Risk	X		X	X	X		X	X
Allocation	X	X	X	X	X	X	X	X
Concentration	X						X	
Correlations		X						
Historical portfolio status and returns	X		X	X	X	X		X
POSITION ANALYSIS								
Total returns including income	X						X	
Asset quality	X		X				X	
MANAGEMENT QUALITY								
Portfolio benchmarking	X		X	X				X
Fees break-down and transparency			X			X		X
Compliance with investing strategy		X						
MONITORING								
Market	X	X			X	X		
Industrial sector		X				X		X
Individual securities	X	X	X	X	X	X	X	X
Portfolio underperformance		X	X					

INVESTOR PERCEPTIONS

SATISFACTORY

- Transactions (platform dependent exceptions)
- Portfolio analysis & reporting (but can be improved, simplified)
- Stock screening tools and analyst information with reservations
- Portfolio simulator

NOT SATISFACTORY

- Feedback on performance incomplete (short-term position focus; dividends? currencies? long-term? benchmarks; lack of trust)
- Planning tools do not match investor needs or are not usable
- Monitoring tools considered distracting and not adopted
- User experience: difficult navigation, non-intuitive, complex, irrelevant data
- Tax reports (user-dependent issue) + platform-specific productivity issues

INVESTOR "NEGLICENCE"

- Not knowing their tool
- Some investors neglecting portfolio thinking (main interest in stock-picking)

INVESTOR QUOTES

General user experience

"Platform X is horrible. We recommend our customers not to use it"

"Has anybody ever asked investors what the platforms should do?"

"Did they actually try it out to see if people would really use it?"

No investor focus

"No online broker data is really good. Banks do a better work"

Low cost
Easy transactions

"I buy successful businesses, not portfolios"

**Contrarian style**

"I could use this for investing my relatives' money, but not my own money"

RETURNS ??

"It is obvious where these guys get their money"

Conflict of interest

"The only way you know your returns is to calculate manually"

COMPLEXITY, USABILITY

"It's like like with old ERP systems: they give you so much information you can't make a good decision"

INFORMATION OVERFLOW

"Takes 2 hours to get total allocation to 100%. I can do this in 30 min. with Excel"

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ONLINE PLATFORMS HAVE NEGATIVE INFLUENCE ON DECISION-MAKING
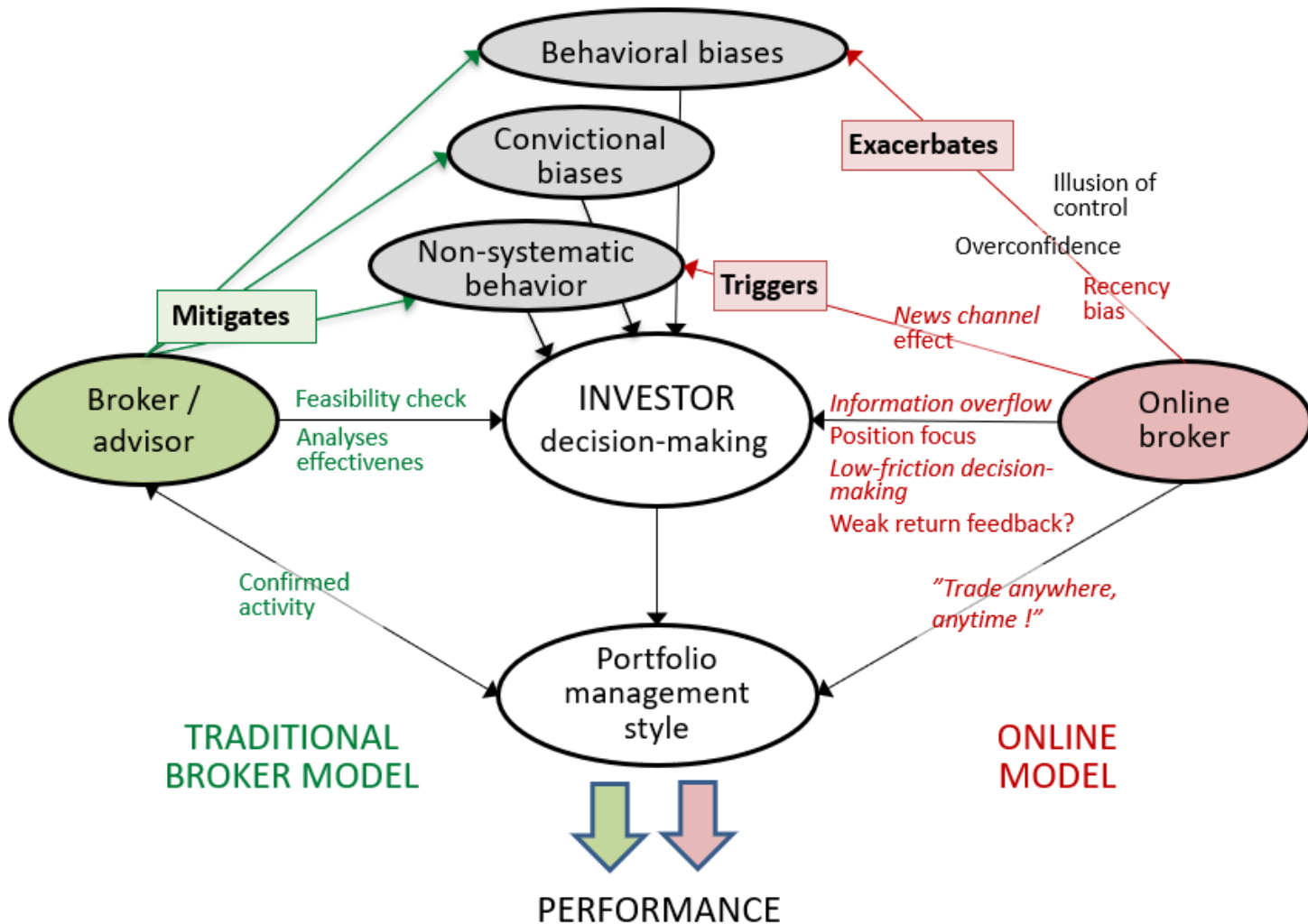
PERCEIVED ONLINE PLATFORM SHORTCOMINGS

Shortcomings and design issues

	DESCRIPTIONS	Investor interviews in Part I	Platform tech. analysis	Platform investor reviews	Asset manager interviews
FUNCTIONAL SHORTCOMINGS					
Limited investing return feedback	Generic problems include erroneous return data due to cash transfers, ignoring changes in currency exchange rates, not including dividends, and limited past performance analysis.	X	X	X	X
Obscure fee reporting	A problem in non-Mifid II regulated platforms. Some investors claim this cannot be coincidental. Excess withholding taxes in case platform provider does not take into account double tax agreements.		X	X	
Limited (adoptable) portfolio level decision support	Adopted portfolio level decision support was limited to portfolio analyses/reporting, portfolio position specific information dominating. Risk analyses based on variables were considered "a theory thing"		X	(X)	X
Non-analytic decision support and information overflow	Excess amounts of unfiltered irrelevant information to make decisions upon. No interpretation of data.	X		X	X
Productivity issues	Manual calculations required. A number of investors claim losing time with inefficient user-interfaces. International tax filing requires considerable manual effort.			X	
Single market platform	Access only to single-country markets using a single local currency		X		
DESIGN/INTERACTION ISSUES					
Lack of investor-oriented design	Investors feel the platforms are not made for them. Some functions not used as design not making their existence evident		X	X	
Complexity, lack of intuitiveness and usability	Users felt unnecessary complexity of functions, counter-intuitive user-interface and difficult navigation for desired functions.	X	X	X	
Behavioural exacerbation instead of mitigation	Platform communication promoting need for changes in the portfolio. User-interface clues to execute transactions.		X	X	

PERCEIVED ONLINE PLATFORM SHORTCOMINGS
Lack of functionality

	DESCRIPTIONS	Investor interviews in Part I	Platform tech. analysis	Platform investor reviews	Asset manager interviews
LACK OF DECISION SUPPORT FUNCTIONS					
Platform planning functions missing or not considered relevant by investors	Retirement or tax relief account planning utilities exist. No adoptable functionality for general purpose investing planning		X	X	
No strategy-specific sub-portfolios	2/8 platforms could consolidate multiple internal accounts. This required a time-consuming back-office contractual process.		X		X
Difficulties in finding appropriate new investments	Stock screeners were found to be complex to use "*like finding a needle in a haystack*".	X		X	
No investor sample adoptable portfolio builder	Based on top-down allocation. Investors found the function not easy to use, not matching their investing style. Trust issues		X	X	
Portfolio rebalancing assistance not applicable for investor sample portfolios	Rebalancing only for investors using a predefined asset allocation tool.		X		
Monitoring functions do not serve investors	Limited portfolio level monitoring. Position monitoring not used by investors as considered distracting. Frequent unfiltered newsletters considered more distracting than useful.		X	X	
Lack of support for systematic investing process	No link from plans to execution and control. Investor notes-of-purpose restricted to alerts. Tracking of past investor activity and parameters complex to use.		X	(X)	(X)

PART 3

Investor evaluation of Design Science initiatives
for enhanced investing process support

IMPROVEMENT INITIATIVES BASED ON PART II ANALYSES

PART II ISSUES	PART III PROBLEM DEFINITIONS / SOLUTION CONCEPTS TO EXPLORE	PRIMARY IMPROVEMENT GOALS
FUNCTIONAL PROBLEMS		
Limited investing return feedback	Whole problem analyses User (investor) priorities Feasibility and development issues	Correct, representative performance feedback to support portfolio management and learning
Obscure fee reporting		Transparent and consolidated fee reports with break-downs
Limited portfolio level decision support		Portfolio-level decision support to have the same priority and visibility as position data
Information overflow, non-analytic decision support		Filtering and focusing to relevant data, interpretation of data
Productivity issues		Saving investor's scarce resources for essential tasks
Single market platform	User implications	(not an R&D, but platform provider business issue)
DESIGN/INTERACTION ISSUES (Cross-platform deficiencies)		
Lack of investor-oriented design	Problem descriptions User priorities	An investor-prioritised front-end / user interface
Complexity, lack of intuitiveness and usability		User-centred intuitive UI design with non-investing features reduced
Behavioural exacerbation instead of mitigation		Replacing nudges for new transactions with calls to 'keep the course' with supporting data
LACK OF DECISION SUPPORT FUNCTIONALITY		
Platform planning functions missing, restrictive, or not considered relevant	*HOLISTIC INVESTOR PROFILING*	From complex, inflexible allocation plans to pragmatic objectives. Enabling default customisation
No strategy specific portfolios (exception exist)	*HIERARCHIC PORTFOLIO STRUCTURE*	Allowing behavioural and global portfolios
Difficulties in finding appropriate new investments	*INTELLIGENT INVESTMENT SELECTION*	Facilitating investors' favourite activity BY matching it with current portfolios and preferences
No adoptable portfolio builder (for the investor sample)	*INTERACTIVE PORTFOLIO CREATION/REVISION*	Investing style independent portfolio builder with simulated outcome before transactions
Effective monitoring only for security prices	*INVESTMENT PORTFOLIO MONITORING*	Full portfolio level monitoring; including positions, improved relational or comparative alert variables
Lack of support for maintaining systematic investing process	*INVESTING PROCESS MANAGEMENT*	Linking individual investing tasks to a managed process

Example initiative, PROBLEM model:

Incomplete return feedback

"Buy & forget" investors unaware of problems

Engaged investors want better performance feedback

Access to investment return data
- User-friendly access to returns may be limited to recent data only
- Key return data hidden among "*sea of numbers*"[104]
- Compared to position data, portfolio level returns may be limited
- Default views promote short-term position returns
- Portfolio reports may not be accessible immediately but need to be *ordered* with a delay
- Portfolio data is in unsuitable format for quick review
  - No consolidation of returns, need to "manually" calculate from multiple statements
  - No comprehensive break-down of returns

Return components
- Unclear, which components included
- Only part of return components included
  - Capital income omitted
- Unclear if returns are net of **all** fees
  - Excess withholding taxes withdrawn
  - Currency exchange fee and spread components
- Technical challenges
  - After-tax return calculations complex

Errors
- Cash transfers result to erroneous or confusing return figures
- Changing FX rates ignored (buy/sell rates differ, but expected to be the same)

Perceived as errors – confused investors
- Selling positions seem to lead to arbitrary return figures
  - Changing of security cost base after transactions (complying with tax rules, but not with investor intuition)
- MWR, TWR not intuitive in cases of cash transactions and fluctuating portfolio values

Lack of historical portfolio returns
- Whole portfolio
  - From inception
  - Including all return components
  - Key performance figures: yearly returns, under/overperformance (to assess portfolio management skills)
- Single position cumulative returns

Meaning of returns
- No function to consolidate returns from multiple platforms
- Cannot see returns in home currency (foreign currency platforms)
- No relevant benchmarking available
  - Comparing portfolio returns to investing goals
  - Matching benchmarks
    - Restricting benchmark to a defined set of portfolio assets (only like risk assets benchmarked to stock market index instead of total portfolio)
- Benchmarking positions to peers or comparatives

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Example initiative, DESIGN issue:

Reduce platform complexity

Uniform investor support

Overall navigation problems
    Cannot find an important function
Generic intuitiveness problems
    Not following common interaction practices
    Misleading use of terms
        Examples: 'Home' item performs a logout; 'Portfolio management' does not give access to portfolio management utilities, but rather opens a function for paper trading.
Cognition difficulties because of information presentation issues
    'Click-around user interfaces' (splitting related information into multiple screens)
    Complex 'all-in-one' screens of data of varying importance, or mixing higher-level data and details instead of offering a drill-down data presentation
Misplaced reporting practice
    Multipage report format leading to excess volumes of data
    No access to data at will; need to 'order' reports
Context-sensitive help not provided for non-trivial concepts
Unsolicited information clutter
    Investor comment: "...*this looks like a news channel*"
    Advertisement-like information (invitations to trade)
    Legal notices
Implications of unergonomic interaction
    Function not adopted because of poor usability
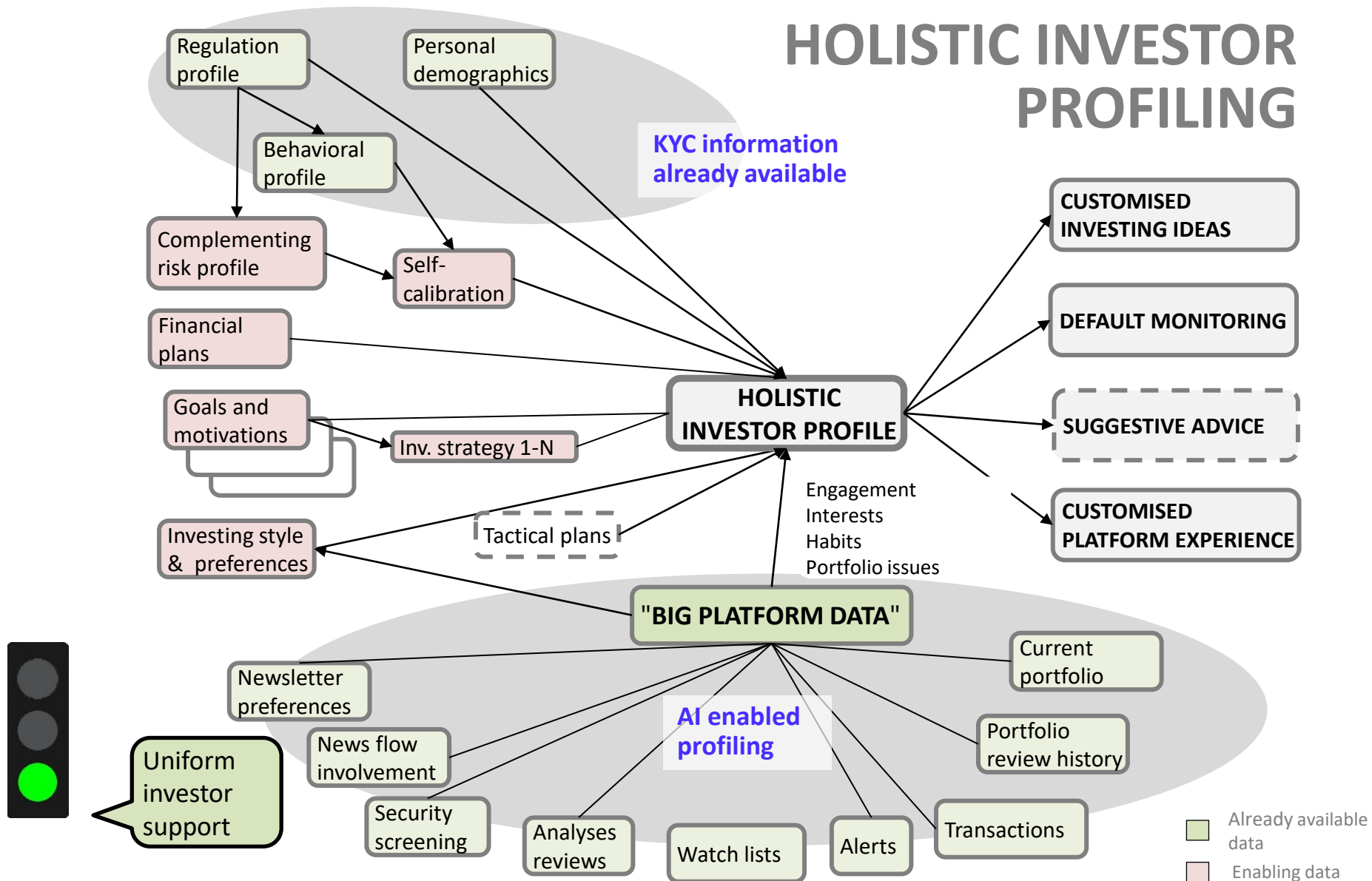   Example: a user estimated requiring two hours to define a portfolio allocation using a portfolio builder
    Miscellaneous isolated problems in user interaction
        Examples: cannot buy an equity without knowing its ISIN number; cannot find a well-known security from a list of dozens of uncommon securities
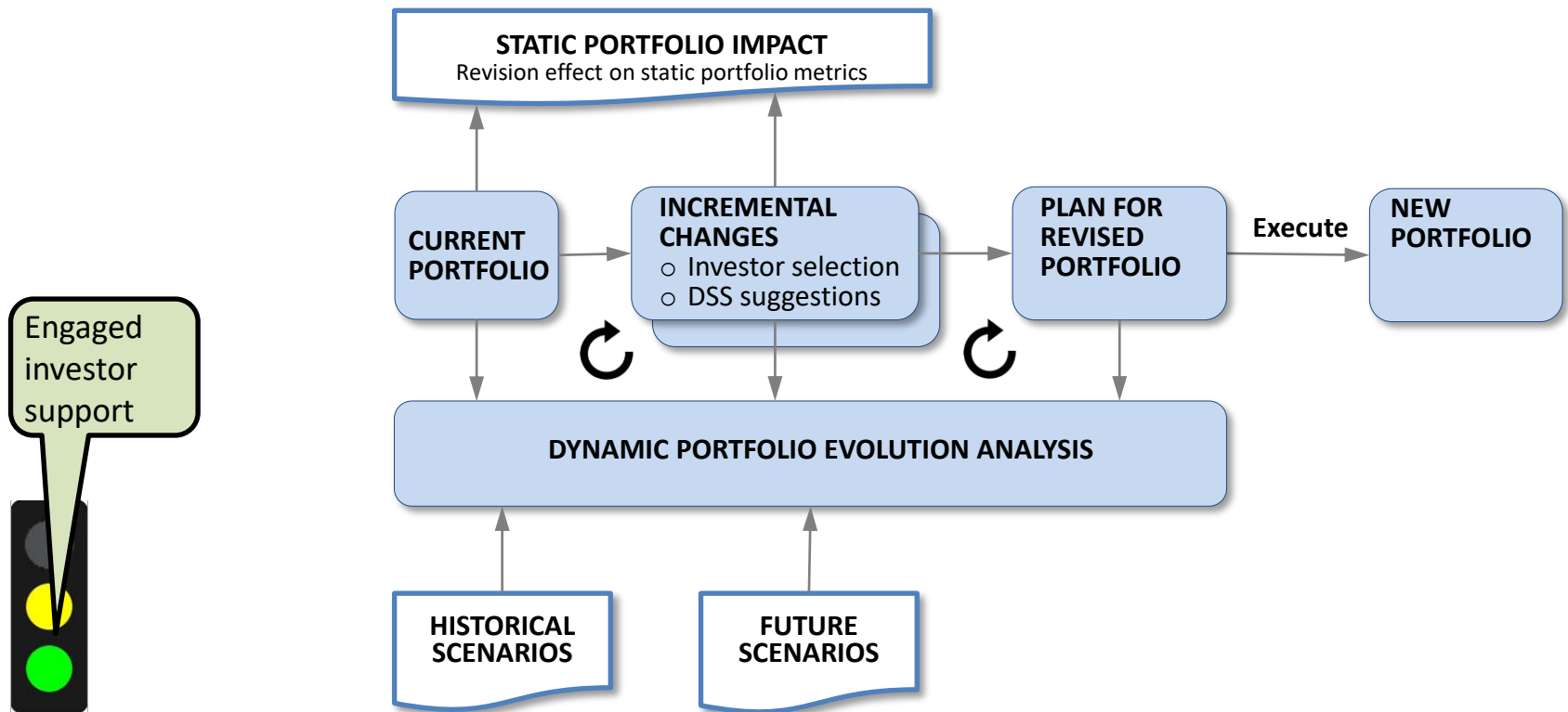Platform-specific idiosyncratic problems

HOLISTIC INVESTOR PROFILING

Regulation profile

Personal demographics

KYC information already available

Behavioral profile

Complementing risk profile

Self-calibration

Financial plans

Goals and motivations

Inv. strategy 1-N

HOLISTIC INVESTOR PROFILE

Investing style & preferences

Tactical plans

Engagement
Interests
Habits
Portfolio issues

CUSTOMISED INVESTING IDEAS

DEFAULT MONITORING

SUGGESTIVE ADVICE

CUSTOMISED PLATFORM EXPERIENCE

"BIG PLATFORM DATA"

Newsletter preferences

News flow involvement

AI enabled profiling

Current portfolio

Portfolio review history

Uniform investor support

Security screening

Analyses reviews

Watch lists

Alerts

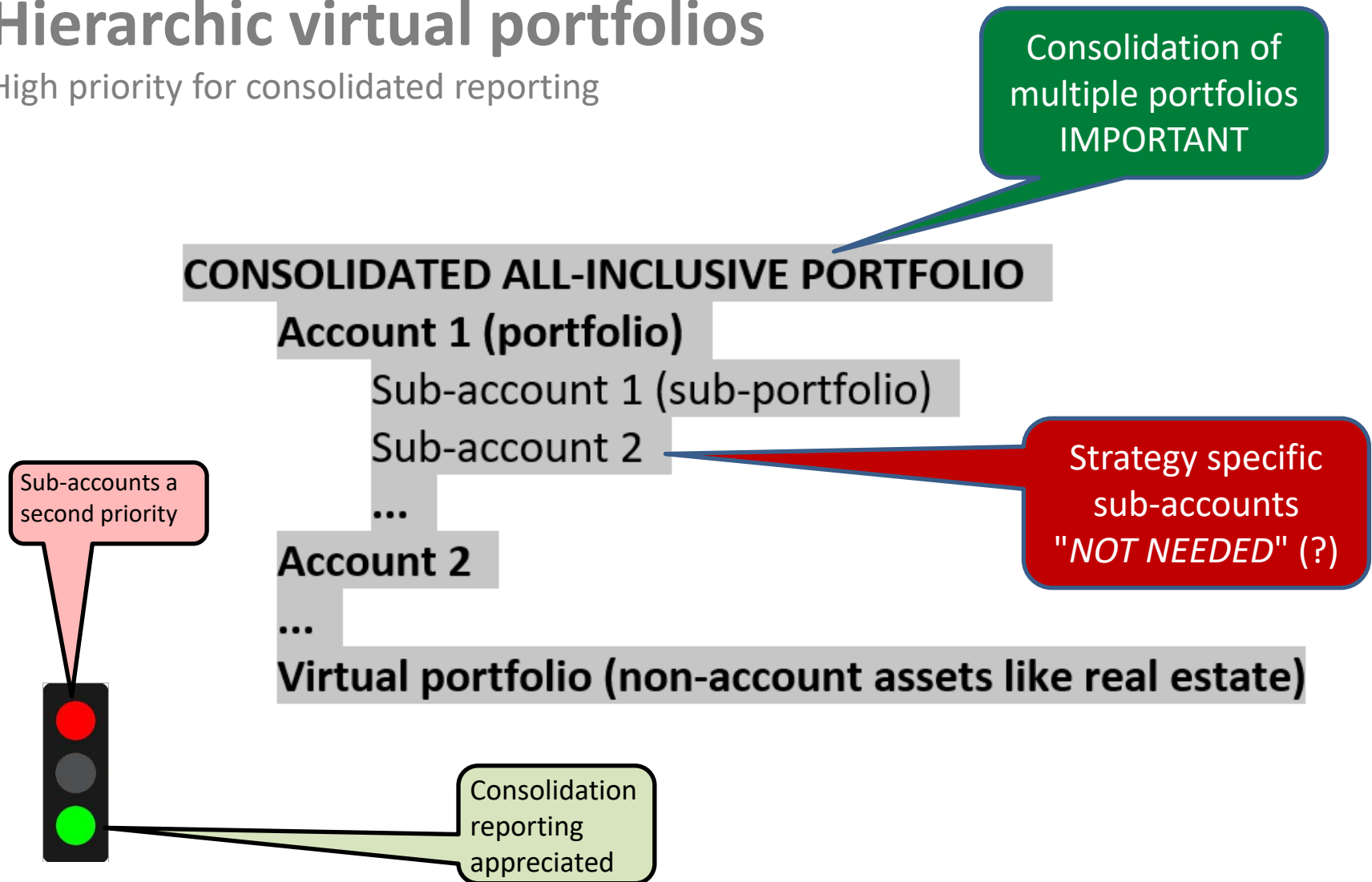Transactions

Already available data

Enabling data

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Interactive (what-if) portfolio revisioning

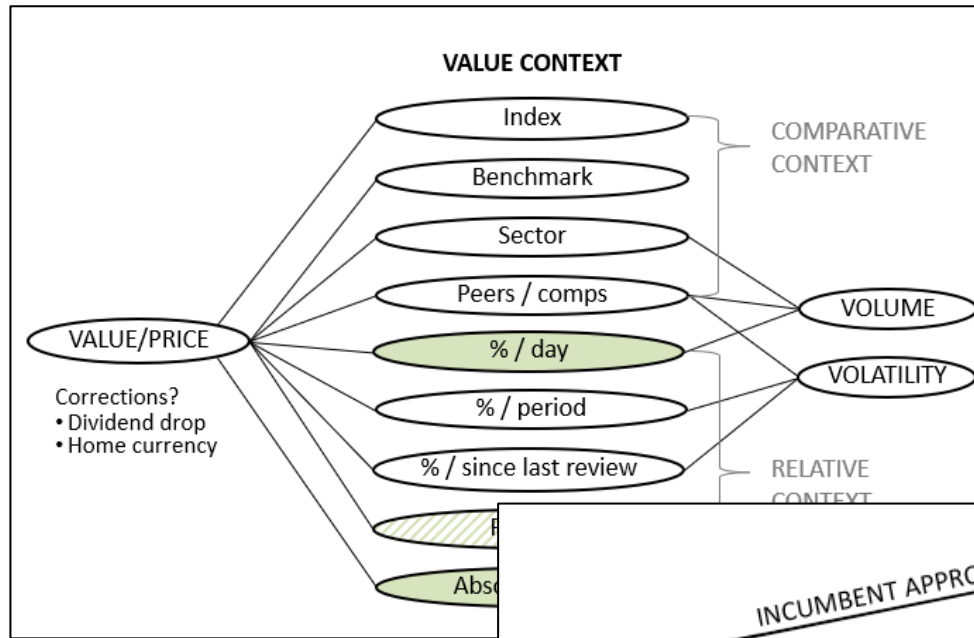An alternative for 100% automatic or no decision support on portfolio management
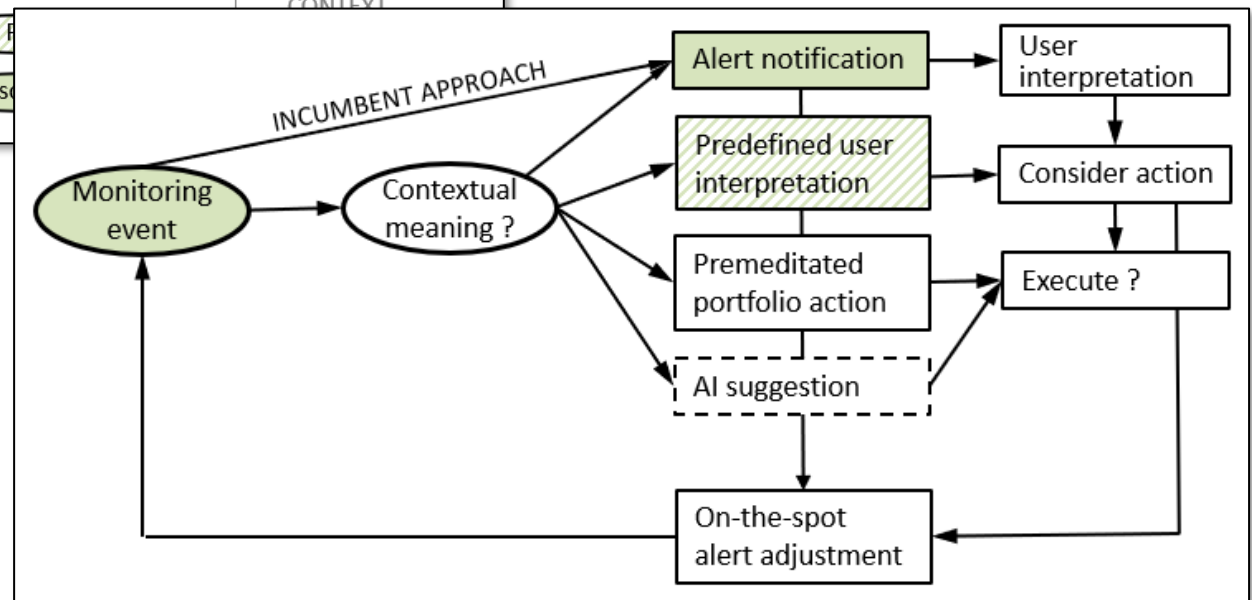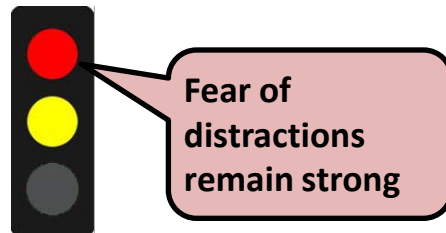
Hierarchic virtual portfolios

High priority for consolidated reporting

Consolidation of multiple portfolios IMPORTANT

CONSOLIDATED ALL-INCLUSIVE PORTFOLIO

Account 1 (portfolio)

Sub-account 1 (sub-portfolio)

Sub-account 2

...

Account 2

...

Virtual portfolio (non-account assets like real estate)

Sub-accounts a second priority

Strategy specific sub-accounts "*NOT NEEDED*" (?)

Consolidation reporting appreciated

Meaningful monitoring instead of distraction

VALUE CONTEXT

- Index
- Benchmark
- Sector
- Peers / comps — COMPARATIVE CONTEXT
- % / day
- % / period
- % / since last review — RELATIVE CONTEXT

VALUE/PRICE

Corrections?
- Dividend drop
- Home currency

VOLUME

VOLATILITY

Abs...

Incumbent platforms: portfolio level monitoring missing

Fear of distractions remain strong

INCUMBENT APPROACH

Monitoring event → Contextual meaning ?

- Alert notification → User interpretation
- Predefined user interpretation → Consider action
- Premeditated portfolio action → Execute ?
- AI suggestion

Consider action → Execute ?

On-the-spot alert adjustment

Example – solution concept:

Investing process management
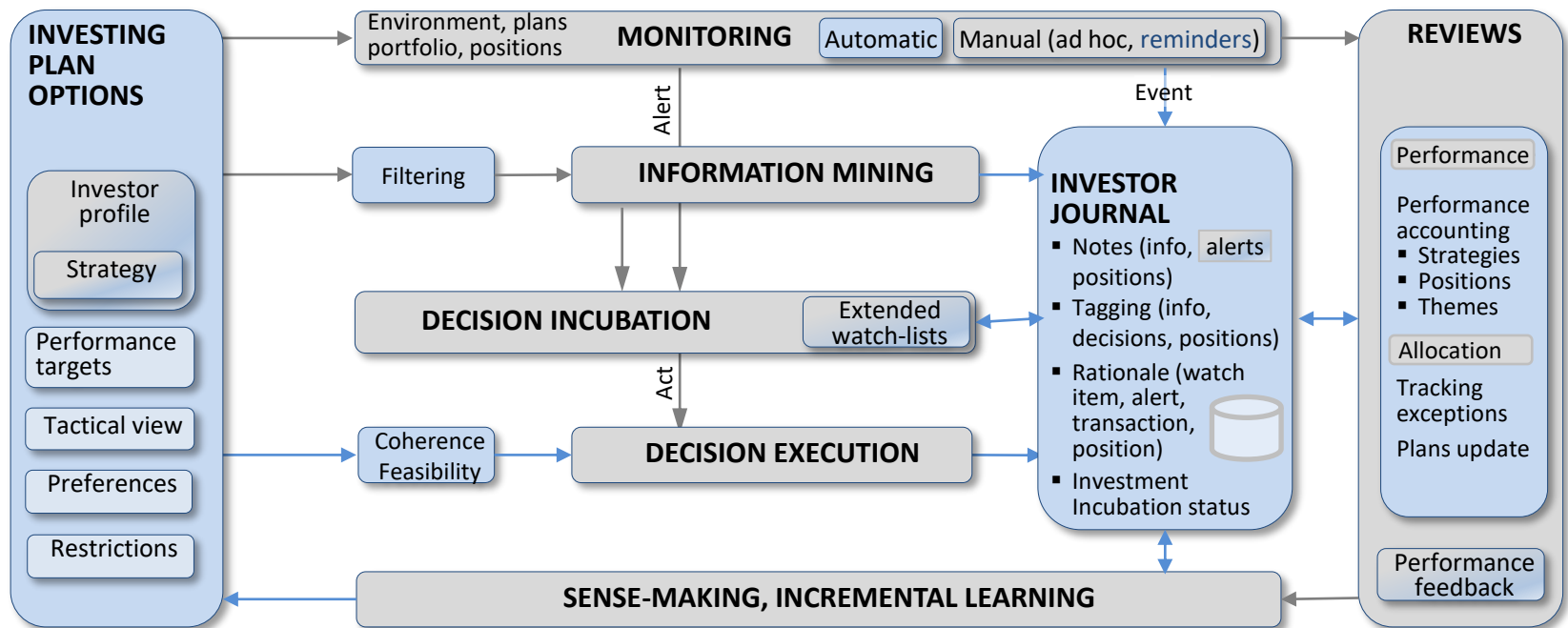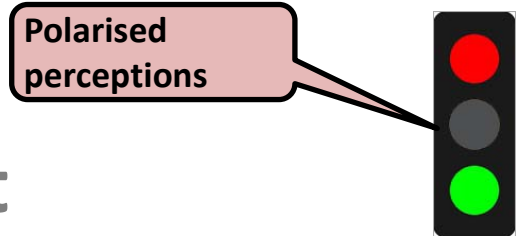
Investor profile focused passive screening

Investment ideas

Investor defined monitoring
o Existing watch-lists
o Alerts

Themes related recommendations
o Online account provider
o 3rd party
o Investor defined

Analyst recommendations
o Online account provider
o 3rd party sources

Pre-screening criteria

Investing style
o Profile
o Tactical

Portfolio fit
o Profile vs. current port-folio

Analyst priority

Platform "big data"

Suggesting an investment short-list

Portfolio balance consideration

Investor current preferences and priorities

Active selection criteria (excl./incl.)

Suggestions delivery schedule and method

Investor considerations

Forward to watch-lists for incubation

DIY security analyses

Portfolio impact analysis

Notification setup

Execute transaction

Incubate → Execute

Uniform investor support

Investor evaluation of *design science* initiatives

Part I	Part II			Part III		Future	
INVESTOR ISSUES	**USER-INTERACTION SHORTCOMINGS**		**PLATFORM FUNCTIONAL SHORTCOMINGS OR CONTRIBUTING FACTORS**	**SOLUTION CONCEPTS EXPLORED**	**CONCLUSIONS FROM EVALUATIONS**	**RECOMMENDATIONS AND SUGGESTIONS**	
Implicit planning	Lack of investor-oriented design	Information overflow, non-analytic or interpreted decision support / Complexity, lack of intuitiveness and usability / Behavioural exacerbation instead of mitigation	No adoptable general purpose planning functions	Holistic investor profiling	Accepted due to benefits in other functions	Enabler for some other solution; need to be implemented first	Development of investor focused front-end
			Single-strategy, unconsolidated accounts	Hierarchic portfolios	Consolidation of external portfolios is the main investor interest	1) 'Real-time' sub-account creation 2) Open banking initiative for account consolidation	
Position focus			Limited portfolio level decision support	Interactive what-if portfolio revisioning	Favoured due to usefulness and simulations	Prototype with historical scenarios. Replace rebalancing with extended portfolio health checks	
			Trading orientation Unfiltered investment propositions Intrusive position monitoring	Investment portfolio monitoring	Perceived distractions neutralise perceived benefits	More intelligence in monitoring needed. Configurable alert delivery to avoid distraction.	
Under-diversification			Screening functions do not consider investor needs and portfolio imbalances	Intelligent security selection	Supports most investors' favourite activity	Prototype	
Ignoring investing tenets			An investor issue. Educational resources can be found.		-	To nudge investors to more normative practices, example: high visibility of portfolio characteristics	
Inattention to performance			Limited investing performance feedback: - perceived errors - scope of performance data - limitations in historical performance - no consolidation of global accounts.	Comprehensive and investor focused performance feedback	A shortlist of improvements would satisfy investors	Review by operators	
			Obscure fee reports (only non-Mifid 2 compliant platforms)	Satisfactory incumbent solutions identified	Relevant only for non-EU residents	Best practice reporting solutions exist in the market	
Non-systematic investing			Support found if using model portfolios or top-down allocation (usability questioned)	Investing process management	Polarised opinions between inv. personas	Prototype of a simplified solution could change part of user evaluations	
Lack of time resources			Productivity issues specific to platforms Generic: incompatible tax reporting		Varying, investor context specific perceptions	Consortium research for nationally generic 3rd party tax solutions	
-			Single market platforms	N/A	Issues with FX, transfers	(Business issue)	

To improve
OVERALL DESIGN

- Better investing outcome **feedback** to boost learning and portfolio management

- **Usability** & user experience

- Investor **profiling**

- **Information overflow is NOT decision support**

- Needed: information **interpretation** and preconceived suggestions

- User **interaction** instead of no decision support or 100% automatic or delegated portfolio management

- Enable **partial adoption** of portfolio theory

- Behavioral **mitigation** instead of behavioral provocation

To improve
FUNCTIONALITY

- Performance analysis: access, inclusiveness, accuracy, attribution, benchmarking, currency, tracking, trustworthyness

- Introduce investor profiling (multiple applications)

- Information flow and notification management

- Interactive portfolio management

- Meaningful automatic monitoring instead of distracting alerts

- Portfolio structure and consolidation for analyses

- Investing process management?

To improve
USER EXPERIENCE

- Simplicity
- Intuitiveness
- Reduce excess cognitive load
- Acknowledge needs of intermittent use
- Enable incremental adoption of functions

"A budget does not guarantee software quality"

TARGETED OUTCOME

- Increased adoption of DSS (decision support) with alternative design

- Speeding up learning with stronger performance feedback

- Nudging investors to more normative practices

- Reduction of behavioral provocation

- More systematic investing management

➢ Improved risk-return performance

NEED FOR APPLIED RESEARCH / DESIGN SCIENCE

- From regulative risk-profiling to more **holistic investor profiling** (enabler)

- Revise **performance and attribution feedback**

- Investor-adoptable, **interactive portfolio creation & management**

- **Automating portfolio monitoring** (intelligence, interpretation, suggestions)

- **Management of information overflow** (profiling, interpretation, suggestions)

- **Design guidelines** to reduce complicity and cognitive load

No business incentive to justify innovations ?

INCUMBENT ONLINE TRADING/INVESTING PLATFORMS ?

- Why to invest in order to **reduce commissions** (order flow) income ?!

AUM-BASED BUSINESS MODELS ?

- Majority of big banks **not ready to invest millions to cannibalise** asset management services
- Do automated investing services have **capacity** to expand to hybrid investing solutions ?
  - Access to more mature and larger investors
  - Gaining also extra AUM for robo-advisors
- Full-service financial companies improving their overall offering

R&D VENTURE FOR 2nd GENERATION INTEGRATED INVESTING PLATFORM ?

- Technically possible; multiple years R&D period required; serious entry barriers
- Independent business model **impossible** ?

R&D VENTURES FOR 3rd PARTY DECISION SUPPORT MODULES ?

- One-to-one interfacing of modules to existing systems
- **Scaleability challenges ?**

Research and R&D initiatives

	Fundamental research	Applied science	Precompetitive R&D	Practitioner R&D
		Design Science		
Investor decision making and profiling for decision support	From financial utility to contextual rationality: definition of inv. profile / Decision incubation / Qualitative decision criteria	Investing process <> momentary decision-making	Use of investor profile in decision support	In the woods (regulation-only focus)
Decision feedback and performance attribution	Information display and decision-making / Feedback & learning	Finance: how attribute performance / Personality tendencies	Short-term position focus -> investor feedback / Behavioral mitigation	Conflict of interest ?
Hierarchic portfolios (consolidation & partitioning)			Application in analyses / UI prototype	Lack of standards
Interactive portfolio revisioning	Goal ?	What-if comparisons	Interaction concept & UI prototype	No incumbent "role model"
Automatic non-dis... monitoring/interp...		AI filtering and text analysis	Default configuration / Prototype of intelligent monitoring	Conflict of interest? / However: meaningful signals get considered
Investing process management		Model for an investing process	UI demonstration	No business model / No standards
Reduce platform complexity	Accumulation of cognitive load	Interpretation, AI suggestions	Demonstration	ROI ?

Lack of immediate business model to support investors =>
Need for pre-competitive R&D and applied science

EXPECTED BENEFITS FROM ALTERNATIVE DESIGN
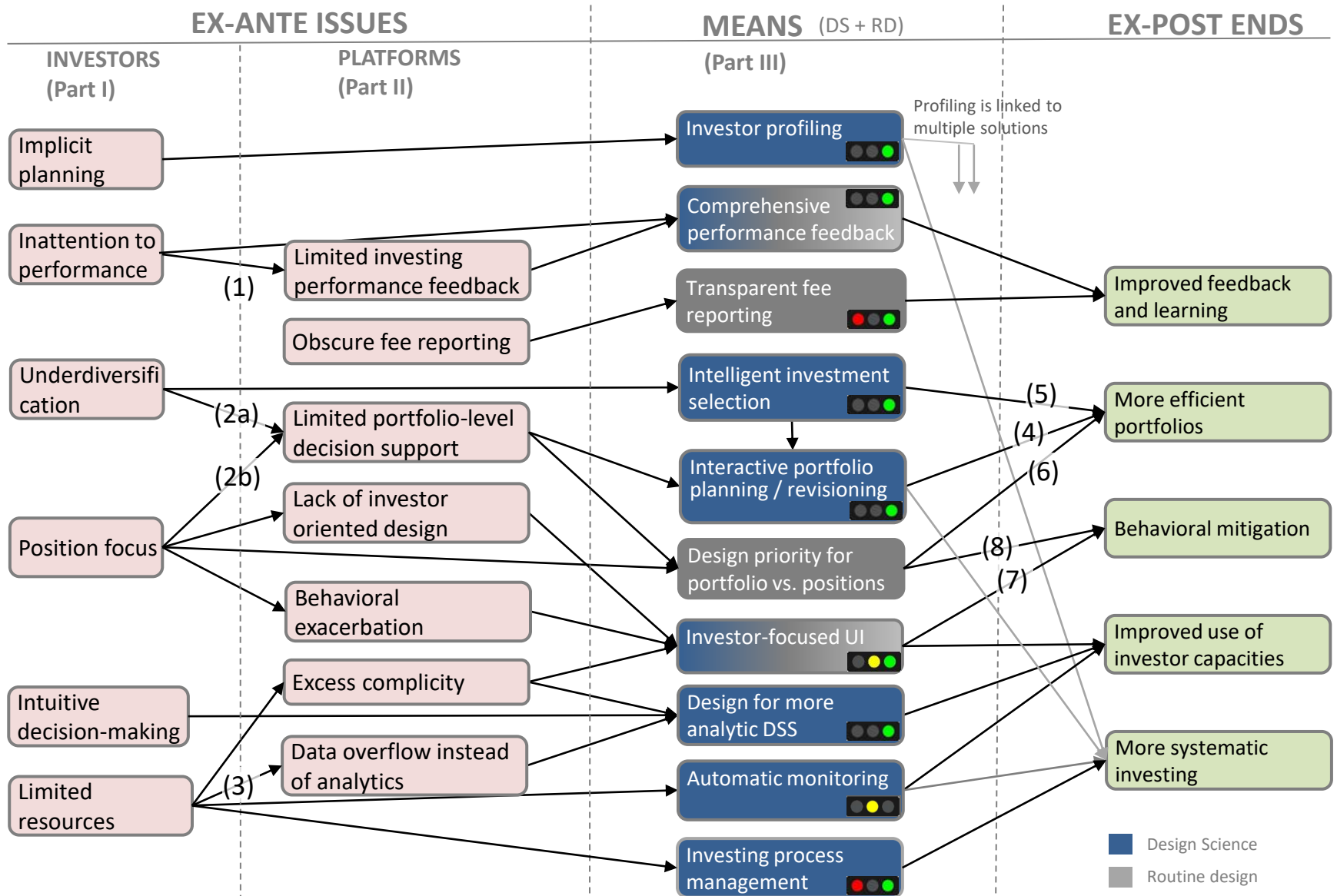
FUTURE ENABLERS

EMERGING EXTERNAL INTERFACES

- Standards, directives and forcing regulation
- "Industry standard" interfaces
- Dominating interface providers

MODULARITY, BEST-OF-BREED MODULES

- Profiling to replace or complement plans
- Analysis feedback (correct, consolidated, intuitive, attribution, educative)
- AI interpretation and advice
- Interactive planning
- AI monitoring to replace naïve alerts

CONSORTIUM RESEARCH INITIATIVES + REGULATION

- Enabling modularity, interfaces
- Performance transparency in addition to fee transparency
- Streamlining taxation processes