Shared Research Project

Research to improve customer experience and safety when using escalators

Cost of proposed approach:

The total project cost is in the region of £600k, and the precise scope shall be determined by the steering committee to make best use of available resources. The research cost is to be shared between participating retailers and HSE, through HSE's Shared Research Programme.

The cost of installing any interventions in particular stores is expected to be met by the retailer concerned and not from the research budget. A key aspect of the research will be, under the guidance of the steering committee, focussing on interventions that can reasonably be implemented. It is not anticipated that baseline filming will be required in stores from every participant, though where possible the team will undertake work across the partner's portfolio to give maximum benefit to those contributing to the research.

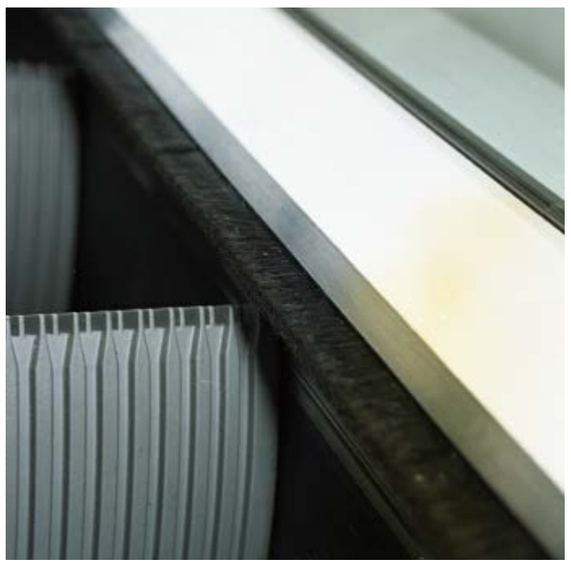
Benefits of participation:

- Input to and influence over direction of study through steering committee
- First access to the evidence based solutions identified to improve customer experience in store, at a fraction of the cost of commissioning such research in isolation
- Evidence to support operational policies, procedures and procurement specification
- Evidence of concern for customers' comfort and safety in store, specific example to cite in annual report etc working with the HSE and other enlightened retailers

Our expertise:

Phil Beards is leading our escalator research within the Human Factors group at the Health and Safety Laboratory. Phil and his colleagues have worked to reduce the occurrence of falls both amongst workers and members of the public. Our experts have undertaken investigations of many fatal stair accidents, several escalator accidents and a vast number of other falls. Research in recent years has focussed on the design of stairs to aid human reliability, thereby reducing the risk of falls. The team also has a track record in observational research, and the development of effective and cost-effective interventions.

Dr Matt Dicks at the University of Portsmouth focusses his research on the study of interpersonal perceptual expertise and the visual control of movement. The theoretical outlook of his research is based on contemporary perspectives informed by James Gibson's ecological approach to visual perception. Matt gained his PhD in skill acquisition at the University of Otago, New Zealand. His current teaching is in the area of skill acquisition across the undergraduate and postgraduate courses, and includes Psychology of Skill Development, and Performance and Applied Skill Acquisition and Expertise. Matt brings this human performance expertise to the project.



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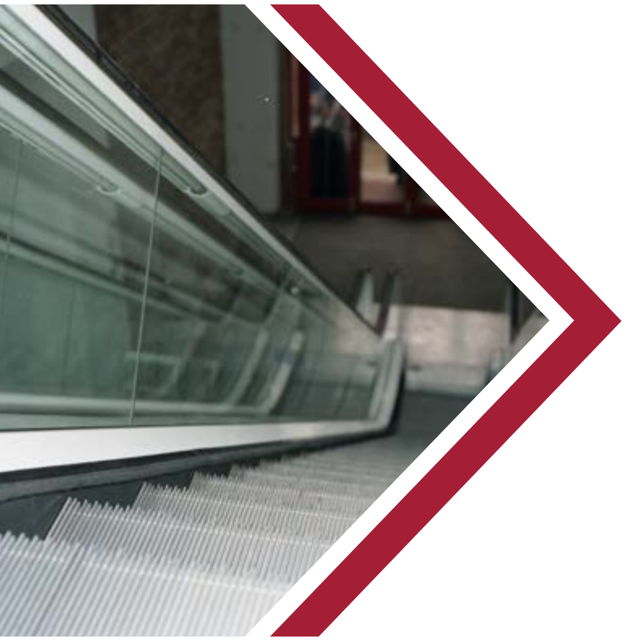
Large retail premises and transport hubs (airports, national rail stations) that are spread over several floors need customers to easily flow from one floor to another, in order to make the visitor experience easy. Customers generally have three options to move from one floor to another: Stairs, Lifts and Escalators. Each has their pros and cons, and the selection that an individual makes will be partly through personal preference and partly determined by availability.

Whilst most customer journeys involving escalators happen without incident, there are a number of fatal accidents known to have occurred in retail and transport premises in recent years, and many more with less severe consequences. The design and specification of escalators is based on the engineering skills and knowledge of the manufacturers, but there is little research into the user experience. Given the way in which the user is moved through a change in level without any protective guarding between them and the lower level, there is an inevitable risk of injury should any falls occur. The movement of the escalator itself can exacerbate the consequences of a fall, compared

Whilst there is a body of evidence published on the user interaction with stairs, and how to make that interaction safer and reliable, equivalent evidence is not available for escalators. Currently, a number of assumptions are made, and the engineering know-how of the manufacturers is relied upon. With a lack of evidence of user experience comes a lack of consistency, so there is no convention on what an easy to use escalator looks like.

HSE's Shared Research Programme supports external investment and collaboration in HSE's research portfolio. This allows resources and expertise to be shared for the benefit of all. By supporting the shared research approach, contributing partners will be able to help shape the focus of the research activity, gain ongoing access to emerging findings and have early sight of draft outputs. Shared research is commissioned and managed through an appropriate range of commercial relationships, depending on the scale of activity and involvement. This project is designed to address the specific research question of how to improve customers' experience and safety when using escalators.

For further details please contact us at shared.research@hse.gov.uk



What will the proposed research look at?

It is reasonable to assume that several factors contribute to each fall, and there will always be a compromise between convenience and safety. In discussion with safety and claims experts from the retail and transport industry, the following topics have been identified as worthy of inclusion in the research:

1. Foot placement: Relates closely to speed (below). Can users easily place their feet on only one pallet? What marking should be used to aid foot placement? How many pallets run-on / run-off before separation?

2. Speed / walking: How does this affect users getting on? Off? Relationship with speed? How slow before more people walk? Is walking regional (i.e. where LU condition users to walk)? Is speed to walk same up and down? Should speed be same up and down? Does speed need to be same everywhere to allow learning?

3. Lift selection as alternative: How accessible is lift? Can customers find it? Does it look like a customer lift? Is it quick / efficient? Or congested?

4. Signs: Do customers look at safety signs? Such as the sign required by the standard? Additional signs? Also relates to finding the lift as an alternative route.

5. Handrail: What height should the handrail be? Do shops carry out simple daily condition checks? Is the speed in sync with the pallets? How graspable is standard design? Do children hold their parent's hands for support?

6. Bollards / reversing: Do they have a net positive or net negative effect? Is the approach to the escalator changed? Can escalator direction be reversed? Slightly wider questions would be what affects shoppers' approach to an escalator? On reversible escalators what works best to alert users to direction? Traffic lights?

7. Slipping: Where escalator is outdoors or close to entrance, is slip resistance adequate?

8. Children's footwear: Trapping incidents tend to be childrens' shoes. Are brush guards helpful? Not used in Europe, so how do trapping incidents relate?

9. Individual differences between user groups: Are the experiences of one user group different to another? Do older adults, for example, behave differently to younger adults? How does the use of a walking aid or the number of objects (shopping bags) carried affect user experience? What can be done to ensure that the user experience is optimised for all?

Our approach: Baseline

Using observational analysis of filmed escalators, issues that shoppers experience will be categorised in order to quantify the rate of near misses for any types of incidents that can be observed.

Past work has studied users of steps using this technique, and in the literature it has been used to look at the approach to steps, kerbs, etc. Typically, HSL have seen 100-1000 times near miss rates compared with reported accident rates. This allows significance to be gained within short time periods.

Analysis of the baseline will allow subsequent detailed evaluation and intervention work to focus on:

a. near misses that are indicative of the most serious of accidents,

b. the near misses that are most frequent.

Our approach: Detailed evaluation and intervention work

Through the collaboration of the Health and Safety Laboratory and the University of Portsmouth, the research team have several established evaluation techniques to apply to this project:

A-B testing of in-use escalators

Certain aspects of escalator performance can be evaluated with natural A-B testing experiments comparing in-use escalators. For example, number of pallets run-on and run-off can be compared using live sites with different escalator configurations.

Route selection and navigation

Route selection and navigation in store can be evaluated using a 'mystery shopper' approach with eye tracking. It would not need to be apparent to the research subject that the escalator was of specific interest. Eye tracking can also be used to test signage, to find most used layouts and

Laboratory testing

Where there may be safety risks of experimentation, such as understanding the foot placement across a broad range of speed and marking parameters, this can be tested in the laboratory with confirmation of the final solution in the real world. The laboratory testing approach also helps to filter lots of approaches to find the most appropriate. For example, a wide range of markings varying design, colour, placement, etc can be tested on a cohort to find the most favourable solution.

Our approach: Schedule

Phase	Month
Baseline	1 – 4
Steering group set priorities	5
Submission* of peer review paper – baseline	6
Detailed evaluation and intervention 1 (DEI1)	5 – 12
Presentation and reporting of DEI1 to research partners	13
Submission* of peer-review journal paper DEI1	14
Detailed evaluation and intervention 2 (DEI2)	13 – 20
Presentation and reporting of DEI2 to research partners	21
Submission* of peer-review journal paper DEI2	22
Detailed evaluation and intervention 3 (DEI3)	21 – 29
Presentation and reporting of DEI3 to research partners	30
Submission* of peer-review journal paper DEI3	31
Detailed evaluation and intervention 4 (DEI4)	30 – 38
Presentation and reporting of DEI4 to research partners	39
Submission* of peer-review journal paper DEI4	40
Project report	39
Project close-down and review	40
Public availability of full project report i.e. 12 month embargo	51

*Submission date and publication dates likely to be separated by 6 – 18 months, peer review publication is often a slow process. An appropriate publication will be selected for each paper, and all publications will be open-access as per expectations of publicly funded research.