

Intelligent Mobility and the Campus of the Future

A workshop held in collaboration with the Estates department, University of Nottingham

26th May, 2015. 12pm-4pm. C25 Coates building

WORKSHOP REPORT

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1 Introduction

On 26th May a workshop was held between representatives of the IMPETUS projects and key members of University Professional Service staff, with the following aims:

- Identify opportunities for the development of new systems to enable better movement around and between the University campuses in both the short and longer term
- Increase awareness of potential technologies that are being developed and used by staff and students around the University
- Build new partnerships between different academic and professional services groups within the University

This report summarises the outputs from that workshop, and proposes ways that the IMPETUS project can work with members of professional services staff in the future.

2 Workshop attendees

The following lists those workshop attendees who signed in. Some others were able to attend throughout the day as well (approx. 35-40 attendees total).

Aldred David
Bhatia Paul
Blum Jesse
Chadwick Barry
Chan-Pensley Jamie
Davidson Neil
Dudderidge David
Duncan Keith
Golightly David
Guest Chris
Harrington Kyle
Harris Steve
Henshaw Laura
Hughes Nancy
Kemp Emma
Loya Tom
Marsh Stuart
Morgan Wyn

Nathanial Paul
Nichols Ben
Nolan Andy
Ogundipe Oluropu
Parry Chris
Pearhouse Ian
Pinchin James
Quresh Ejaz
Raventos Teresa
Reed Jim
Sharples Sarah
Skinner David
Stevens Gary
Taggart Nina
Ward Andrew
Watts Elaine
Wright Trevor
Zolotikova Svetlana

3 Workshop agenda

The agenda below outlines the format of the workshop. Presentations focussed on providing examples of the different types of technologies used to capture and support activities, ranging from looking at connectivity on campus and methods of recording personal movements, to analytics tools that are used in support of planning and timetabling activities, to the way in which campus maps are being developed in partnership with google. Discussions included mention of the development of apps to support open day visitors, and Andy Nolan provided a perspective from the estates department that showed how an understanding of individual campus operations can feed into overall estates strategy.

12pm:	Welcome, introduction to IMPETUS project and workshop aims	SS
12.20pm:	Professional services talks to outline relevant activities and challenges on campus	
	<ul style="list-style-type: none">• Andy Nolan – estates• Andrew Ward – heat maps and wifi connectivity on campus• David Aldred – campus maps and google• Neil Davidson – Students and staff on the move: data-driven analysis, visualisations and modelling to understand and improve experiences	
12.50pm:	Outline of workshop activities	SS
1.00pm:	Lunch	
1.30-3.00pm:	Workshops	
3.00pm:	Tea/Coffee	
3.15pm:	Identification of project priorities, discussion of funding streams, next steps	

4 Activity 1: Challenges

The first activity asked those in the room to identify challenges associated with the delivery of services around our campuses. At this stage, colleagues were asked not to consider technical solutions at all.

After the individual tables of participants had identified specific issues and ideas, these were collated into an overall list of challenges. In addition to these challenges, a key set of drivers for any interventions was identified. Outputs from these are summarised below.

4.1 Key Drivers

- Student experience
- Enhancing the reputation of the University
- Building a community amongst all staff and students
- Enabling a 52 week, 24/7 environment
- Maintaining and supporting diversity
- Developing visionary and future proof solutions



4.2 Summary of Key 'Challenges'

The following challenges emerged and were collated from all groups (order is random, not prioritised):

1. CARS-need for more parking spaces and an awareness of availability / location en route.
2. BUSES-ability to make informed decisions about taking the bus i.e. arrival / journey times V walking.
3. BIKES-availability of City Cycles, secure cycle parking and safe cycling routes.
4. TRAINS / TRAMS- potential for a stop at Jubilee.
5. Data driven / evidence based understanding of mobility e.g. 'purposeful mobility'.
6. Development of a smart campus to help with real-time travel decision making.
7. Development / maintenance of clear, consistent signage.
8. Ability to easily 'filter' information for purpose and or need i.e. avoid overload.
9. Ensuring a positive 'Visitor/ Student Experience'.
10. Optimisation of services and facilities i.e. appropriate locations; communication of relative availabilities.
11. Supporting staff / students in working efficiently between locations e.g. hot desking.
12. Understanding and addressing pressure points and congestion /pressure points and times.
13. Need for personalised navigational information to a specific location + information on available resources.
14. Understanding safety / security e.g. vulnerable locations and/or times; managing positive links with the community.
15. Integrating / communicating campus based navigational, locative information with external parties e.g. taxi, ambulances.
16. Communicating dynamically changing, real-time information e.g. room changes, building work.

5 Activity 2: Technologies

The second activity focussed around the technologies that had potential to be developed or applied in the context of a smart/intelligent campus. In addition to the technical ideas that emerged, a number of other issues arose, such as: data exchange / management; algorithms; visuals; mediation; actuation (machines responding to inputs); ethics, privacy and data storage.

The following ideas emerged and include technical and non-technical interventions:

1. (NFC) Near Field Communication Sensors.
2. (RFID) Radio Frequency Identification.
3. 'End to end' integrated decision support i.e. linking interoperable systems / data sources.
4. Integrated optimisation.
5. Interactive / touch screen 'you are here' maps – large screens / key locations.
6. Adaptive signage.
7. GNSS-base navigation.
8. Use of tracking technologies + data already available / accessible in 'real-time'.
9. (UAVs) Unmanned Ariel Vehicles to provide 'real-time data'.
10. 'Real-time' language translator.
11. Campus-wide WiFi.
12. Use of 'Google Cardboard' i.e. for virtual campus walkthroughs / enhanced user experiences.
13. Use of social media analytics / data mining and integration.



14. Combined use of CCTV (real-time travel) + transport information.
15. Benchmarking campus(es) facilities with outside competitors.
16. Accessing potential data from 30K+ students' use of mobile devices.
17. Use of autonomous Segways around campus(es).
18. A comprehensive, clear, up to date map / UoN map app for everyday / overall use.
19. 'Greeters' at a Visitor Centre.
20. Use technologies to a) gather data b) support infrastructure c) deliver information to the user.
21. Combined use of sensors and surveys.

6 Synthesis of technologies and challenges

After the separate consideration of challenges and technologies, groups were asked to pick examples which brought technologies and challenges together. A small sample of these were then followed up in more detail and presented back to the meeting as a whole. These were intended to stimulate discussion, rather than prioritise any specific projects at this stage. The specific examples were:

6.1 Movement between campuses (inc. parking)

- 1) Reduce demand for parking spaces (better public transport; car pool; increase charges; stagger charges; educate on alternatives).
- 2) Increase utilities (using spaces efficiently-better marking; time of day based charging; potential for managed 'double parking')
- 3) Increase capacity (politically sensitive; parking available but not where needed/convenient)

Good parking facilities = improve staff morale, improve recruitment and retention.

Need for 'integrated, intelligent parking' i.e. what's available / when / where.

Need a robust technology for a resilient, scalable solution.

6.2 Signage

Continued need for good physical signage for overall spatial awareness / survey knowledge + not everyone has / uses a phone!

Interactive signage on static screens in key locations for location / route information or adaptive navigational information e.g. MayFest2015.

Facility for larger screens in key locations to link to personal phones, devices.

Information centrally updated, flexible and cost effective for 'one off' events; visitor days; large deliveries etc.

Need to design / deliver information in a way that changes behaviour, intuitive.

Needs to be low powered / low cost, 'green'.

6.3 The Visitor Experience

Need to quantify the relative 'value' of the 'visitor experience', how do we do this?

Need to address different types of visit: 'one-off'; intermittent; more regular commuter.

Importance of giving a positive experience to visiting VIPs and alumni e.g. free / pre-paid parking.

Understanding movement behaviours through 'sensor support'.

How can we 'add value' to a visitors experience i.e. outside the Trent Building notice the lake designed by . . . ; appropriate offers as you pass different retail outlets/cafes on campus.

Creating a more 'personal' experience, pass phone over a QR code and access all the apps you'll need for your visit.

Need to be mindful of data privacy issues.

Suggestion of a 'Visitor Centre' or hub-physical or virtual.

6.4 Integration of navigational information between alternative systems

Navigation information currently very fragmented; need to plan 'end to end' journeys simply and easily.

Navigational information needs to be delivered in a connected / seamless way.

Need for a touch screen location / route finder.

Need for signage to be adaptive - information exchange to be seamless.

High levels of collaboration required between diverse parties / disciplines (possible barrier?).

Need for an integrated data sharing protocol.

6.5 Real-time resource locator

Ability to identify available resources / facilities - when and where, presented as a Google-like list.

Resource / facilities locator could incorporate 'gamification' + tokens i.e. when you lock up your Ucycle bike .

Knowing what's available when and where improves overall student / staff / visitor experience.

More efficient use of resources / facilities, 'spreading the load'.

Tangible idea to present to Research Councils + links with current interest / research in indoor navigation.

7 Follow up/actions

7.1 Key drivers

Any activity that involves the professional services as partners will map onto Strategy 2020. The key drivers that emerged from discussion form the core of these mappings. Discussions with University Management will be held to confirm that these drivers are sensible motivators for activities; assuming they are confirmed, all future collaborations between IMPETUS and professional services will demonstrate how individual activities contribute to these key drivers towards developing a future campus and technology demonstrator.

7.2 Student placements

As part of the IMPETUS project, a small amount of funding is available for student placements. It is proposed that a series of placements are developed between professional services colleagues and academics, so that a call can be sent out for recruitment to a rolling programme of placements from late 2015. A call will be sent to colleagues to ask for submissions for funding from this programme over the next 4 weeks.

8 Appendices

The full listings of the challenges that emerged from the different tables are listed below:

8.1 Table 1

- Emergency services need to be able to access different campus locations more accurately/quickly.
- Review timings of movement patterns i.e. 'things' at night & 'people' in the day.
- Review travelling /working patterns and times to avoid congestion.
- Efficiencies of 'hopper buses' i.e. only 20% full mid morning/afternoon.
- Need for adaptive information / advice on optimal daily commute (alternative routes).
- Need for adaptive information / advice on optimal daily commute (alternative modes e.g. car +available parking V Hopper bus)
- Need to give students updated locative information e.g. relative availability in food outlets.
- Delivering navigational, locative information to 'outsiders' i.e. on open days; to taxi drivers.
- Problems in navigating the Coates Building specifically.
- Problems in communicating last minute room changes.
- Difficulties travelling between campuses e.g Jubilee and University Park: 10 minute walk but perception longer; Hopper buses unreliable (not reactive).
- Need to identify best route to meetings on different campuses (e.g. Hopper / walk / ?).
- Ways to identify car-parking spaces 'on the go', rather than simply driving around / searching.

8.2 Table 2

- Possibilities of a 'traffic free' campus(es).
- Balance between availability of services i.e. 'out of hours' and security.
- Identifying optimal /most appropriate locations for student services and facilities.
- Reductions in air quality due to increasing volumes of traffic / congestion on campuses.
- Greater consideration needed in navigating foreign students i.e. language barriers.
- Balance between enhancing the overall student experience and managing this cost.
- Maintaining the UoN's 'up to date' reputation is crucial in securing on-going revenue.
- Lack of suitably sized meeting rooms e.g. at QMC which inhibits 'collaboration'.
- Lack of 'hubs' / available technology across campuses, where staff can go when working remotely.
- VIPs / delegates / visitors getting lost and getting parking fines = loss of reputation.
- Need for a 'Visitors Centre'.
- Importance of being able to give 'real time' information re: timing / availability of buses; room changes / alternative availability.

8.3 Table 3

- Need to consider the importance/value of students 'physical' affiliation with their School / Dept.
- Opportunity to use intelligent, locative technologies to identify food shortages in outlets and potential waste = a 'greener University'.
- Difficulties in delivering to particular locations on 'open days' / e.g. Mayfest, as not properly marked on maps or identified in situ.
- Bus stops are not located in the appropriate / convenient places.
- General difficulties in all 'users' i.e. staff, students, visitors navigating to specific buildings / rooms.
- Limited parking spaces and increased parking charges.
- Understanding safety & security i.e. vulnerable areas in reducing incidents and crime and increasing student experience.
- Over use of cars and having to 're-park' across campuses.
- Need for adaptive, personalised information to get visitors from car-parks to an academic's office.
- Sharing lifts between campuses.
- Better management and update of travel information at peak times.
- Provision of realistic 'walk-time' estimates across / between campuses.



- Need for better identification of available facilities e.g. nearest free tennis courts, for improved usage.
- The ‘human’ cost of getting lost, tiredness, stress, frustration = reduced user experience.
- The need to consider and ensure safe travel between / through campuses at night.
- The need for lecture etc timetabling that takes into account travel times, disruptions etc.
- The need for easier ways to book rooms, change rooms and notify those affected.

8.4 Table 4

- Better ‘inter-campus’ travel; better information on getting between subsequent lecture locations.
- Appropriate, intelligent cycle routing.
- Estimates of available parking/ optimal times to park.
- Need to recognise physical ‘pressure points’ and under-utilised areas on campus(es).
- Need for building names to be visible on all sides; names, numbers on building need to be replicated on maps.
- Need for signage to be current, correct and consistent.
- Problems with flow of traffic in one-way systems around campus.
- University culture depends on identity and belonging, need to maintain this on a more virtual campus.
- How can we exploit crowd-sourced data to progress navigational / locative issues?
- Pressure to deliver a ‘smarter’ experience to students = positive UoN reputation.
- Informing people of change of UoN entrance / exits with arrival of tram.
- Do we actually know what students and staff need / want; can we quantify any potential changes + benefits?

8.5 Table 5

- Addressing accessibility issues for the visually and physically limited students, staff etc.
- Acknowledging students’ reduced sensory capacities e.g. wearing of headphones.
- Students ignoring cycling safety e.g. cycling without lights, how do we address this?
- Limited bike parking and corresponding changing facilities.
- Limited number of City Cycle Hubs.
- Lack of real evidence base on ‘footfall’ - more anecdotal.
- Not enough maps available for visitors on campus.
- Limited understanding of the capacity / occupancy of a building in real-time.
- General assumption against meetings on the Jubilee Campus.
- Peak time congestion at main entrances / exits.
- Understanding capacity of Hopper buses at certain peak times.
- Appropriate location of Hopper bus stops; appropriate naming of bus stops and recognition of these on maps.
- Efficient linking of the UoN Hopper buses with the public bus service.
- Lack of available parking and restricted parking e.g. next to Cripps Health Centre.

