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THE LEARNING PROCESS OF ACCESSIBILITY INSTRUMENT DEVELOPERS

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Abstract: Scant knowledge of land use and transport integrated (LUTI) planning support tools such as accessibility instruments (AIs) for developing joint strategies and the implementation gap of such planning instruments are considered the main barriers for integrated spatial and mobility planning (te Brömmelstroet & Bertolini, 2008). Against this background, the research discussed in this chapter aims to ascertain whether, how, and to what extent barriers to land use and transport planning integration can be overcome through a learning process that involves practitioners and researchers from different domains.

The study was conducted during the COST Action TU1002, analyzing the outcomes of joint work developed by researchers with different backgrounds (transport and land use planning) actively participating in the research. During the project 15 structured workshops were organized in different local contexts. Here AIs were applied as a platform for discussion around a given planning problem, and for defining integrated land use and transport planning solutions. The workshops involved groups of selected practitioners from academia, consultancy companies and public administrations with different expertise (transport, spatial planning, and geography). Before and after the workshop, two surveys explored the AI developers' views on accessibility concepts, accessibility instruments and the way they are used. The main results account for changed understanding and attitudes toward AIs due to new insights gained from implementing AIs in a concrete case study and from interaction with other colleagues and with practitioners. The results also discuss the impacts that the implementation of AIs in the workshop had on practitioners in terms of how accessibility concepts were received and could be used in practice.

Keywords: Experiential learning cycle; structured workshop; integrated land use and transport planning, accessibility instruments

1. INTRODUCTION

According to experiential learning theory (ELT), self-directed learning methods are powerful and effective processes for facilitating and inspiring individuals and groups (Kolb & Kolb, 2012). Such processes are based on the iterative sequence of interlinked knowledge and experience, reflection and action, with one nurturing the other. This relationship was a core concern of American pragmatism (Dewey 1960; 1964), according to which practical knowledge can only be generated within actual experience. This key pragmatist notion was further articulated and made operational in the field of education by Kolb and Fry (1975): observation and reflection on concrete experience leads to the forming of abstract concepts, which are then tested in new situations, eventually resulting in the adaptation of existing practices (i.e. concrete experience). The process is based on a learning cycle driven by the resolution of the dual dialectics of action/reflection and experience/abstraction (Figure 1).

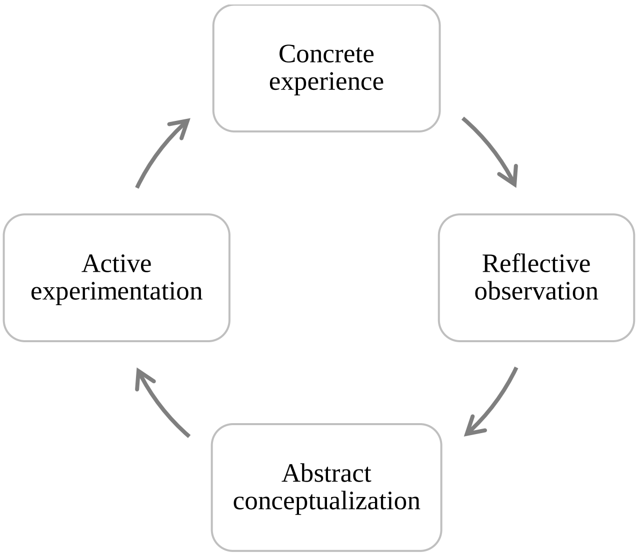

Figure 1 - Experiential learning cycle (Kolb, 1984)

In the planning literature, studies on applications of the experiential learning cycle to land use and transport planning demonstrate that this method can lead to innovative planning concepts and processes (Balducci and Bertolini, 2007; Straatemeier et al., 2010). Following these studies, the principles of experiential learning were applied during COST Action TU1002 to create insights into implementing the practice of accessibility concepts and accessibility instruments (AIs).

The research had two main objectives. The first was to bridge the knowledge gap between land use and transport planners by using a shared language based on accessibility concepts. Indeed, there are substantive differences between land use and transport planning domains (te Brömmelstroet & Bertolini, 2008): transport planners focus more on analytical theories and models, setting optimal system variables, dealing with uncertainty in the future by means of demand forecasting methods, according to scientific instrumental rationality (Wilson, 2001). By contrast, land use planners use more qualitative information, mapping places and functions, working in more communicative settings, based on deliberative rationality principles (Forester, 1999; Healey, 1997; Innes, 1995).

The second objective was to involve stakeholders and practitioners actively in the planning process through the use of AIs. In this respect, there is a broad consensus in the international debate that planning support AIs should be an integral part of the decision making process and meet context and user requirements (Vonk, 2006).

To achieve the above objectives, a process framework was applied to facilitate a constructive and structured dialogue between, on the one hand, transport and land use plannersand, on the other, among researchers, model developers and practitioners.

This chapter presents a study of the learning process that took place among accessibility instrument (AI) developers during the four years of the TU1002 COST Action. Monitoring was carried out through two surveys administered in different temporal phases, aiming to ascertain how and to what extent AI developers obtain new insights into accessibility concepts and instrument implementation. The first survey was administered at the beginning of the COST Action and the other after the AI testing phase with practitioners. This phase was conducted by means of local workshops carried out in 15 different European countries (plus Australia), involving practitioners in the fields of land use and transport planning. During the workshops local practitioners and AI developers experienced the use of an accessibility instrument in the attempt to solve a planning problem for the local context, and discussed its usability in practice (see chapters in part 4 of the book). To guarantee different views on the usability of the instrument, both transport and urban planners from the private sector (consultancy), public sector (municipality planning office) and academia were involved.

The chapter focuses in particular on the following questions:

- whether the COST Action was perceived by AI developers as a valuable experiential learning occasion and what the most fruitful learning occasions were;

- what AI developers learnt in terms of overcoming barriers between land use and transport knowledge, both in terms of methodological aspects and planning approach.

With respect to the first point, the key element is whether the AI developers learnt from each other and whether they understood the importance of integrating their knowledge with that of practitioners; if positive, whether they changed the characteristics of the AI they developed at the beginning of the action.

In terms of overcoming differences between planning approaches, we investigate whether the transport planners learnt from land use planners and vice versa; whether "rationalist planners" learnt from the "collaborative planners" and vice versa. This raises two questions:

- to what extent do AI developers understand the meaning of participatory workshops?
- what strategies did AI developers use to handle usability problems of their AI?

Finally, the chapter explores whether the interaction with stakeholders through the local workshop had an impact on the local contexts. We investigated, from the perspective of AI developers, whether practitioners perceived AIs as usable tools in their planning context, and whether they might apply AIs to take planning decisions in the future. We also analyzed the main barriers to implementing accessibility analysis and instruments in the local contexts, according to the AI developer's viewpoint.

The chapter is organized into four sections. In section 2 the research methodology is described, including the survey structures and the panel of case studies. Section 3 discusses the main results and some conclusions are drawn in section 4.

2. THE METHOD

The analysis of the accessibility instrument developer's learning process was based on a survey research methodology, which followed the AI developer's steps during the action, before and after the local workshops were carried out (Figure 2).

The research process itself consisted of two parallel blocks of actions: a sequence of activities performed by the AI developers and a monitoring procedure. The activities run by the AI developers are AI setup, its application in the local workshop and any AI modification. The monitoring process consisted of two surveys: the Accessibility Instrument Survey (AIS) and the Learning Survey (LS). The two questionnaires administered to the AI developers aimed to collect general information on the instruments and assess what they had learnt during the process, what they had changed in the AI and the way they would use it.

In the process, the local contexts where the workshop took place influenced the process due to the presence of specific barriers. In some cases the local context was modified after the running of local workshops, as better explained in section 3.3.

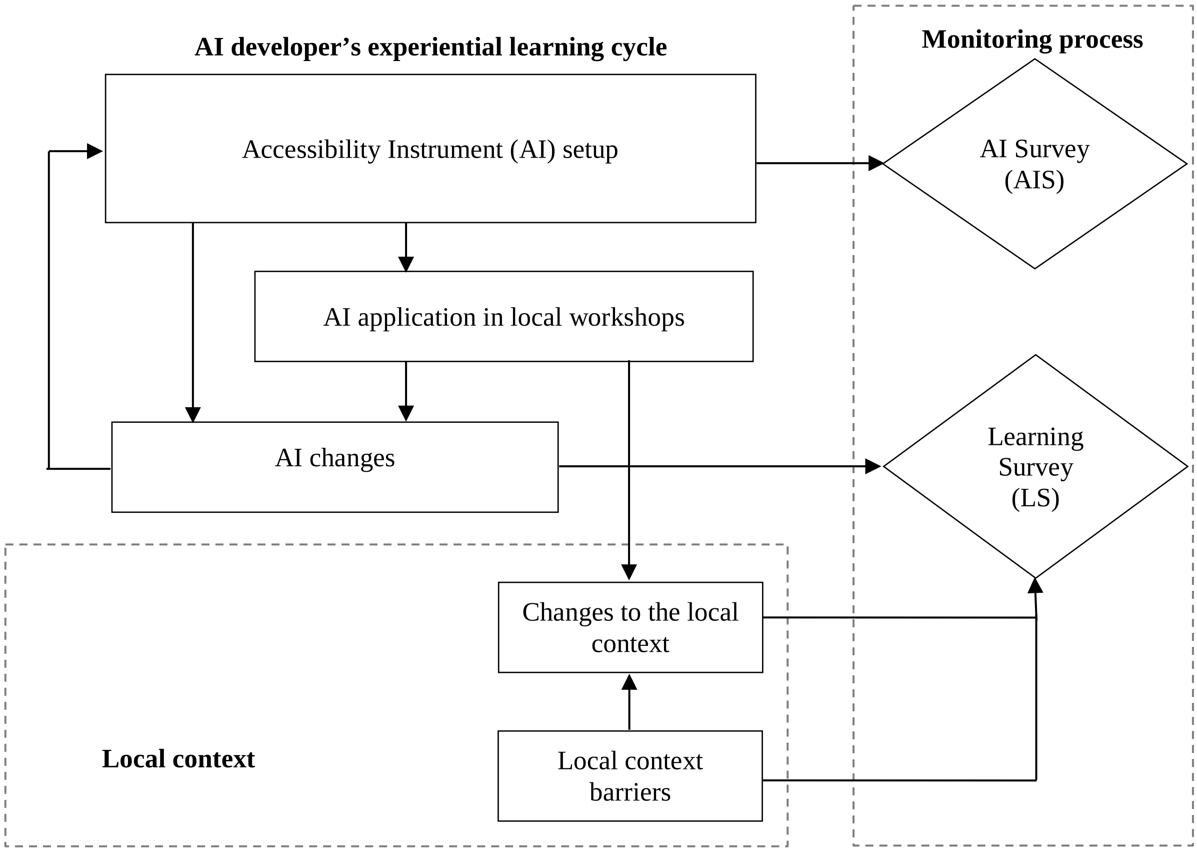

Figure 2 - The research process: the AI developer’s steps during the COST Action and the learning monitoring process

The panel of accessibility instruments submitted to the COST Action consisted of 21 AIs, of which 15 were also tested in local workshops. Only 18 AIs from the original panel (see Table 1) participated in the complete experiential learning cycle and responded comprehensively to the two surveys, following the workshop template and the measurement protocol that was developed during the COST Action (te Brömmelstroet et al., 2014). For each AI, one AI developer answered the survey, after consultation with other members of the work unit (WU).

WUs that carried out the local workshop

	Country	Local context	Accessibility instrument	AI acronym
1	Australia	Adelaide	Spatial Network Analysis for Multimodal Urban Transport Systems	SNAMUTS
2	Cyprus	Limassol	Space Syntax: Spatial Integration Accessibility and Angular Segment Analysis by Metric Distance	ASAMeD
3	Finland	Helsinki	Heuristic three-level Instrument combining urban Morphology, Mobility, service Environments and Locational Information	HIMMELI
4	Germany	Munich	Erreichbarkeitsatlas der Europäischen Metropolregion München	EMM
5	Greece	Volos	Measures of street connectivity: Spatialist Lines	MoSC
6	Italy	Rome	Gravity Based Accessibility Measures for Integrated Transport-Land Use Planning	GraBAM
7	Italy	Turin	Interactive Visualization Tool	InViTo
8	Netherlands	Breda	Joint Accessibility Design	JAD
9	Poland	Krakow	Geographic / Demographic Accessibility of Transport Infrastructure	GDATI
10	Portugal	Porto	Structural Accessibility Layer	SAL
11	Slovenia	Ljubljana	From Accessibility to the Land Development Potential	ATI
12	Spain	Madrid	Isochrone Maps to Facilities	IMaFa
13	UK	Edinburgh	Spatial Network Analysis of Public Transport Accessibility	SNAPTA
14	Turkey	Izmir	Cittaslow – Travel Distribution with TRANSCAD	Cittaslow
15	Sweden	Gothenburg	Accessibility Atlas for the Västra Götaland region	AAVG

WUs that did not carry out the local workshop

	Country	Local context	Accessibility instrument	AI acronym
16	Germany	-	Guideline for Network Planning	GNP
17	Austria	-	Metropolitan Activity Relocation Simulator	MARS
18	UK	-	Database suite for calculation of UK accessibility statistics	ACCALC

Table 1 - Work units responding to AI Survey and Learning Survey

The Accessibility Instruments Survey (AIS) (Papa et al., 2014) was structured into five sections as follows:

- Section 01: general information on AI developers;
- Section 02: baseline issues of AIs;
- Section 03: main planning goals considered in developing AIs;
- Section 04: main AI operational characteristics, including accessibility measures and (socio-economic, spatial transport, temporal) components, the level of disaggregation with regard to spatial, socio-economic and temporal data and analysis, and transport

modes and opportunities considered; this section also includes questions evaluating the AI developer's perception of the ability of the instrument to replicate reality and the computing speed of the AI;

- Section 05: AI developer's perception of the usability of the accessibility instrument in planning practice and of the potential end-users.

The Learning Survey (LS) followed the local workshops in which the AIs were applied and tested in practice with a group of selected practitioners. The LS can also be split into different groups of questions.

- Section 01: ways, occasions, and extent to which the AI developers learnt during the COST Action;
- Section 02: AI developers' changes to the instruments;
- Section 03: AI developers' learning about new ways they can use AIs;
- Section 04: workshop impacts on the local contexts;
- Section 05: AI developers' perception of external barriers in using AIs.

The results from the first survey (AIS) show a great heterogeneity of AIs[1] in terms of the purpose of the analysis and nature of the planning issues: the AIs vary with regard to the accessibility measures used and the way they present the analytical results. Indeed, the wide range of AIs analyzed used accessibility measures that differ in terms of the spatial unit for analysis, socioeconomic groups whose accessibility is to be assessed, type of opportunities, mode of travel, and metrics of the attractiveness of destinations and of travel impedance.

The LS results give an insight into the outcomes of the learning process in terms of changing understanding and attitudes of AI developers. These will be detailed and explained in the following sections.

3. RESULTS: AI DEVELOPERS' LEARNING

The results reported herein underline the following aspects of the AI developers' learning process:

[1] A detailed description of the accessibility instruments analyzed is available in Chapter 3 of TU1002 COST Action Report 1 (Bertolini et al., 2012), and a description of the workshop experiences for each work unit is available in Chapter 3 of Report 2 (Larsson and Curtis, 2014).

- the learning occasion as it was perceived by the AI developers;
- the changes made (if any) to the AI;
- the AI developers' perception of implementation impacts with a focus on the barriers of the local context.

Where possible, a before- and after-analysis were made between the results of the two surveys.

3.1. Learning occasions for AI developers

The AI developers were involved in several activities during the COST Action, namely participation at scientific meetings, the comparison of AIs, and organization and participation at local workshops. All these formed our perspective which we called "learning occasions", because they were potential chances of creating knowledge and getting experience.

In the surveys we asked the respondents to rate each learning circumstance on a scale from 0 to 10. An overview of the average scores of how each "learning occasion" was perceived is given in Figure 3. In so doing, we distinguished the WUs that carried out the local workshop from those that did not.

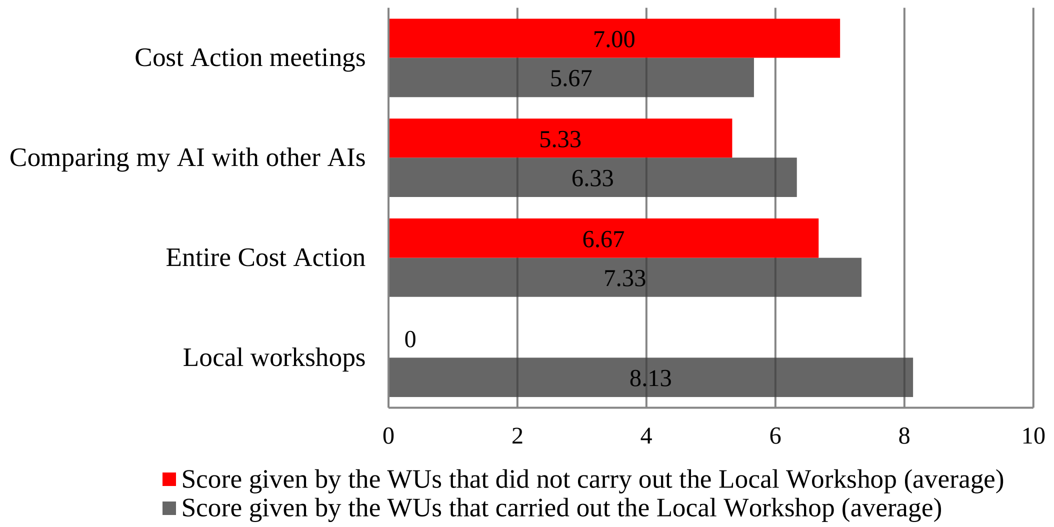

Figure 3. Average score of different "learning occasions" (number of WUs that carried out the local workshop= 16; number of WUs that did not carry out the workshop=2).

AI developers gave a positive value to the COST Action experience, stating that in general it constituted a good occasion for learning. The difference between the WUs that carried out the workshops and the ones which did not is not substantial (7.3 vs. 6.6). Some WUs stated that what they learnt from participating in the Action is the "wide variety of accessibility instruments and concepts developed" or a "clearer definition of accessibility concepts", "the explanation of accessibility measures and indicators, with the possibility of comparison with both local and international experts", "the variety of possible instruments and their wide usability", and "the inspiring comparison of accessibility planning issues across Europe".

The perception of the AI developers on learning from interactions with other AI developers was lower. This could stem from the fact that during the meetings not enough time was left for collective presentations of the AIs or for group discussions on the single AIs. However, some developers stated that good occasions for learning were the Summer Training Schools for Junior Researchers and Working Group 3 meetings.

If the learning potential during the meetings was perceived as low, the bilateral interactions between WUs and AI developers, on the other hand, were quite successful. The questionnaire asked AI developers about the research networking opportunities that arose or developed during the COST Action. In particular, a specific question was administered, asking whether the WU started or was going to start any collaboration with another WU from the start of this COST Action (joint publications, research projects etc.). Seven WUs would go on to co-author an article or another publication with other members of the Action, in the case of ATI also involving local administration and planning practitioners, and three WUs submitted or started a new research project, such as another COST Action or joint participation in a

HORIZON 2020 Project. Other activities developed are short scientific missions for research or teaching, long-term research exchanges and applications in different local contexts of others' AIs, e.g. the application of InViTo (developed by WU2-Italy) in the local context of Rome (local context of WU1-Italy).

Finally, the local workshop (for those who organized it) was considered the most useful learning experience (average of 8.13). Some developers stated that it was central to understanding "how the instrument can be useful to authorities and practitioners and what aspects are important to make it more user friendly in this direction"; other developers pointed out that "the suggestions and the remarks made by practitioners to upgrade the instrument, while testing it in practice, were fundamental" as in general "the opportunity to test the instrument in a virtual exercise in planning practice through the local workshop helped to explore the instrument's strengths and weaknesses" and "the point of view of practitioners". Some other WUs stated that what they learnt during the workshop was "the key role of transparency for instrument users", "the importance of the instrument as an enabler for discussion rather than a simple instrument for measuring accessibility

Nevertheless, some WUs were also quite critical of the accessibility instrument's application in practice, stressing that much work still has to be done to improve the practical usability of accessibility instruments. In particular, one WU stated that what they learned is that "the use of accessibility instruments in practice is still in its infancy and that many academics and practitioners still struggle to engage with the concept of accessibility". Another work unit stated that "the real problem is that decision makers have no clear idea what they can do with the AIs and how the AIs can support them in the field of decision making".

3.2 AI developers changing the characteristics and use of AI

The analysis also focused on understanding *what* the AI developers learned during the COST

Action and whether and how they put into practice what they learned. In the LS we asked how they may have changed any methodological and other characteristics of their AIs and/or about the changes in the ways in which to use the AI, toward more collaborative planning processes. We investigated two different factors:

- thoughts during and after the workshop;
- thoughts during other activities within the course of the action

Figure 4 reports the number of AI developers that think that one or both the above factors could have influenced the decision to change the AI.

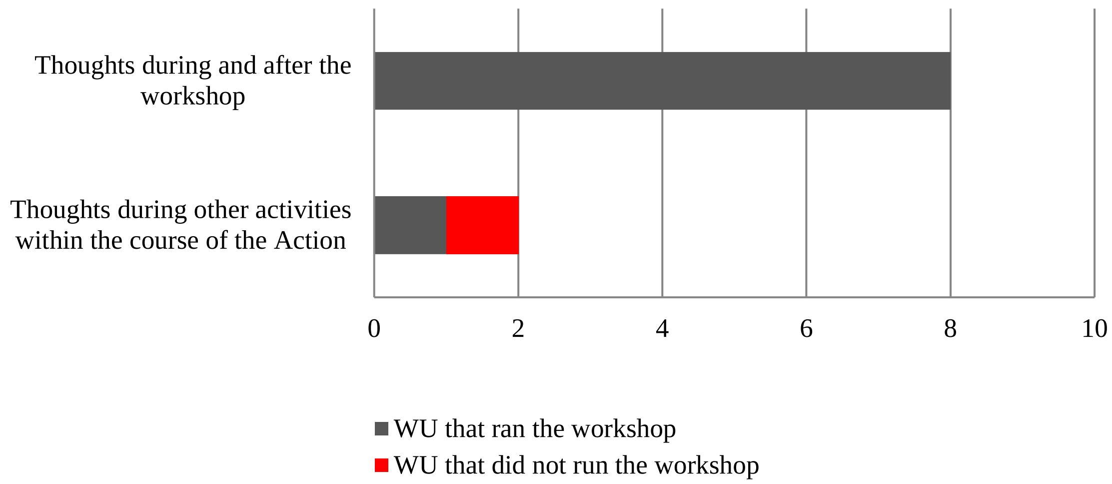

Figure 4. Occasions that led to the decision to change the AIs

Of the total number of 18 WUs monitored, ten changed their AI, eight did not. The main reasons for not changing the instruments were external limits, such as lack of resources to do so (in terms of money, time and human resources) or because the instruments worked well in the workshop, and there was no need for improvements.

The AI developers who stated they made some changes to the AI, explained that these changes were largely due to considerations made by the practitioners participating in the workshops and their own reflections after the workshop, and due to ongoing work outside the Action. Only one WU stated that considerations made by other AI developers met within the COST Action also provided input for changing the AI. In this sense the action may not have devoted enough time for direct comparisons and idea exchanges between the AI developers, with reduced results in this sense.

The ten AI developers who changed their AI were also asked to describe what type of changes they had made, which were classified into the three classes below (Figure 5):

- Structural changes: these concern major changes to the AI, such as a change, or addition, to accessibility measures, or the model structure;
- Planning process changes: these mean changes in how the AI is used in a planning process, for example by improving interaction with practitioners;
- Minor changes: these entail less important changes such as the spatial/socio-economic/temporal aggregation used for accessibility measurement or the transport modes used or trip purposes.

Six AIs experienced structural changes. For example, SNAMUTS added new indicators to make understanding easier, or new thematic fields were added to the Accessibility Atlas, i.e. mobility costs (iso-cost accessibility), or in HIMMELI some model structures were changed in order to increase the versatility of the AI, and other accessibility measures were added to GraBAM. Three instruments had minor changes, namely GDATI or SNAPTA, where usefulness and robustness were improved in representing travel patterns, and InVito, in which the methods for calculating shortest paths were changed. Three instruments changed the process of using the AI in the planning process. In particular, the JAD developers stated that after the COST Action experience, they would start using the AI in the early stages of the planning process (for urban development plans) and would use the AI also for broader planning goals, rather than only for mobility decisions.

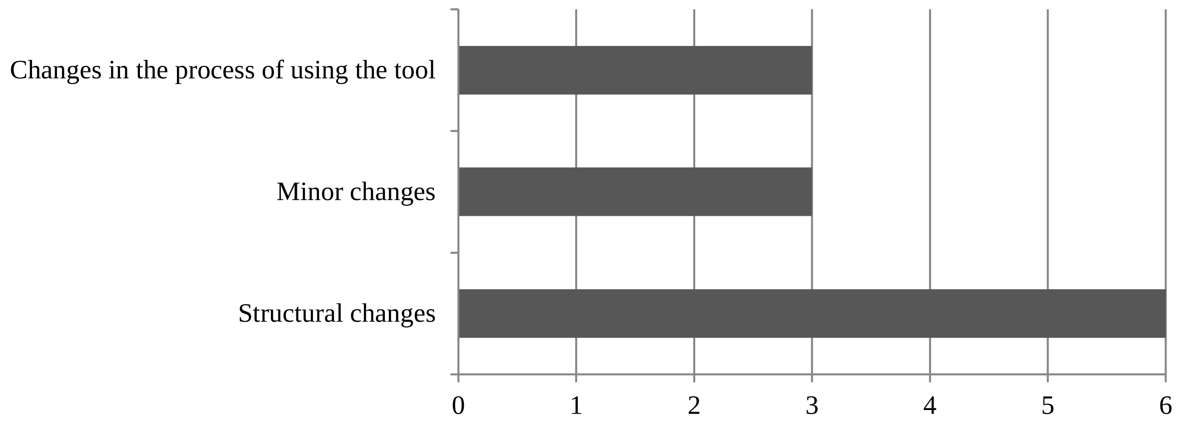

Figure 5. Type of changes in the AIs

To enhance understanding of the changes, we propose here an analysis of the changed characteristics of the AIs, clustering the AIs into four groups according to the main accessibility measure used (time-space measure, utility-based measure, gravity-based and contour measure). The percentage of AIs that changed their characteristics over the total number of AIs is reported for each cluster in Figure 6.

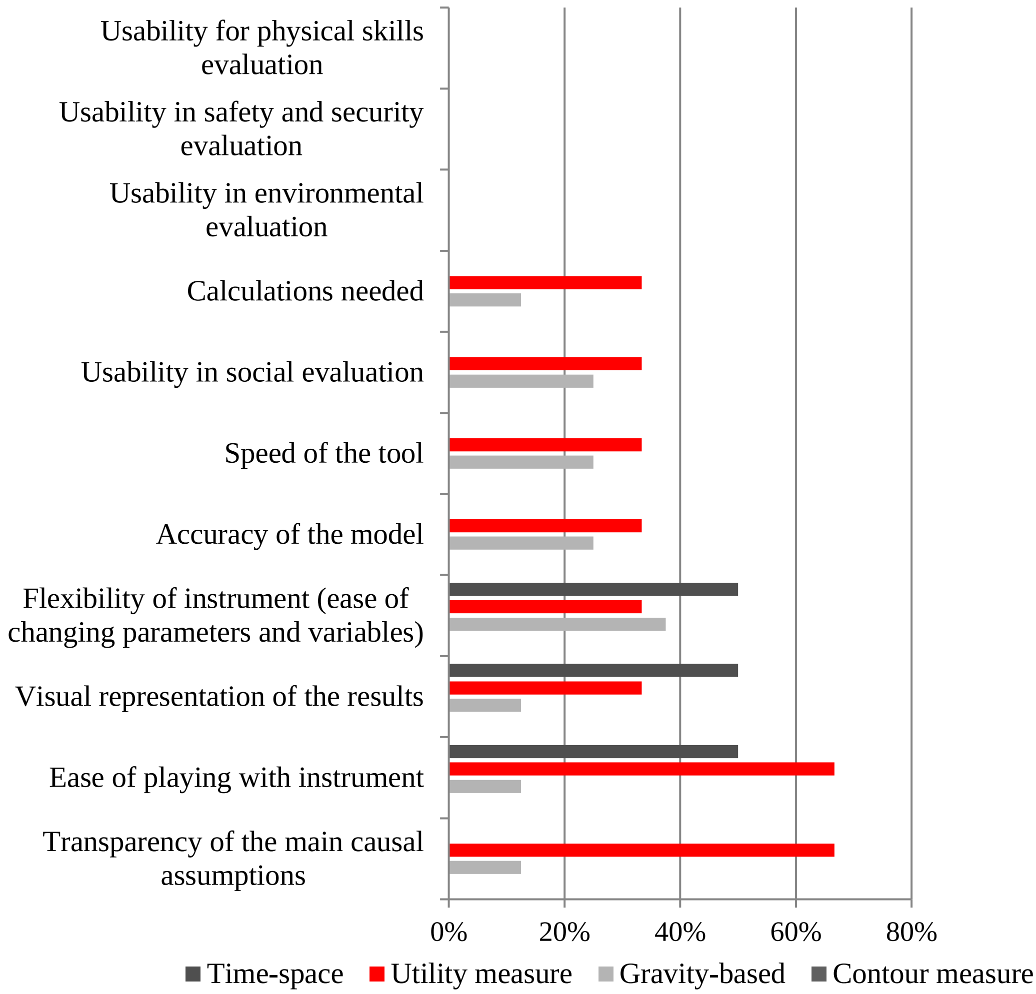

Figure 6. Percentage of AIs that changed their characteristics, for each group of accessibility measure used

In synthesis, the main result that emerged from this analysis is that the more complex the instruments (e.g. those based on time-space or utility-based measures), the more important are the changes that occurred. In particular, two out of three AI developers who made use of a utility-based measure changed the AI to make the main causal assumptions more transparent and to make it easier to play with the AI. Furthermore, half of the developers of time-space AIs changed the visual representation of the result, the flexibility of the instrument and the ease of playing with it. Gravity-based AIs had a greater variety of changes, but the majority were aimed at increasing the flexibility of the instrument and the ease of changing parameters and variables. None of the instruments that make use of contour measures changed their characteristics. This can be explained by the fact that these measures are quite simple and already have a good degree of transparency and flexibility. At the same time, more important methodological improvements were probably too costly for the AI developers in this case.

Furthermore, we compared the average value of the AI characteristics assigned by AI developers before the workshop on a scale from 0 to 10 (the results coming from the AIS) with the improved characteristics of the AIs after the workshop experience (Figure 7 and 8).

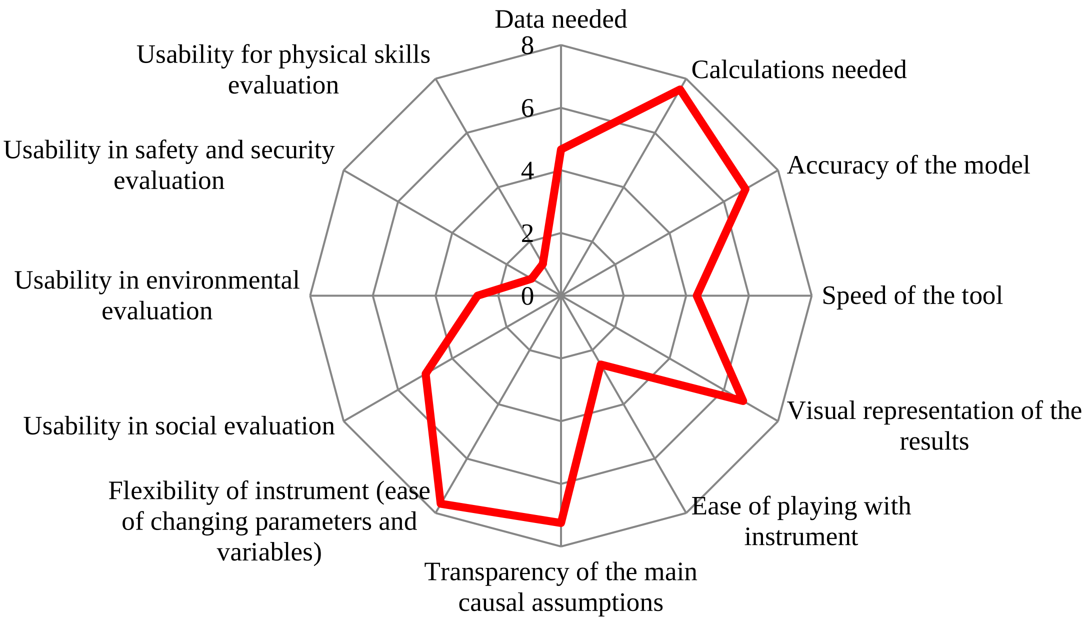

Figure 7. Average score assigned by AI developers before the workshop (Accessibility Instrument Survey)

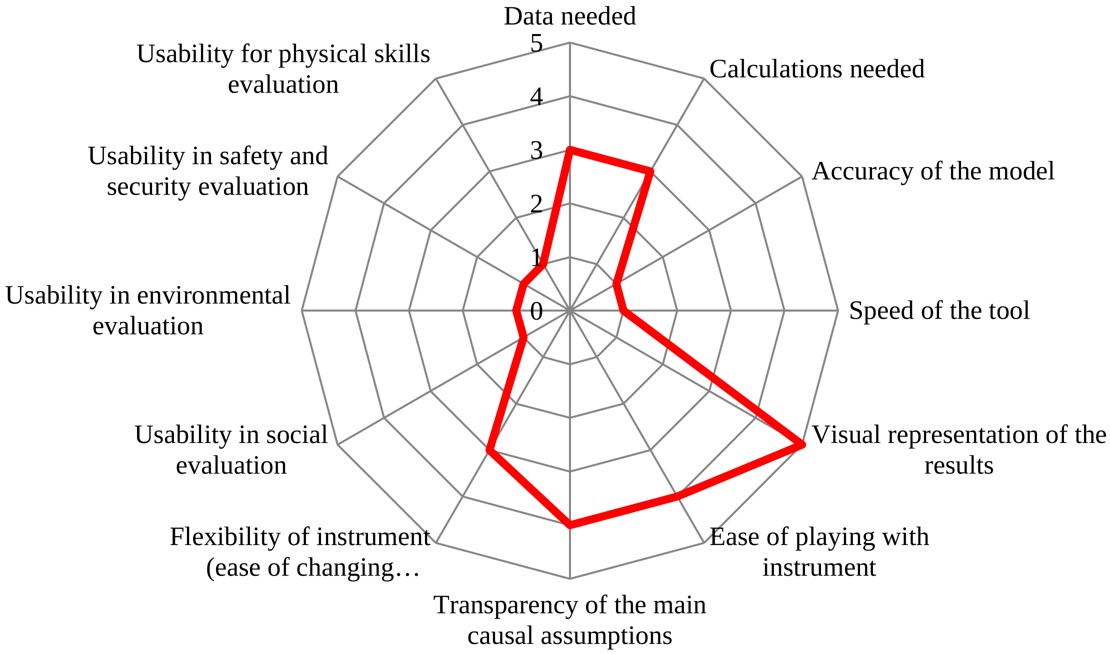

Figure 8. Number of AIs that changed specific characteristics (Learning Survey)

It is worth pointing out that within the group of the WUs that ran the workshop, the most greatly changed and improved characteristics of the accessibility instruments is the visual representation of the results of analysis (GraBaM, InViTo, SNAMUTS, GDATI); ATI and EMM improved the transparency of the main causal assumptions; JAD, InViTo and ATI improved the ease of playing with the instrument. SNAPTA, GDATI and EMM also changed the data needed, in the sense that they reduced the complexity of the AI and the data required for accessibility analysis. Only InViTo and ATI improved the flexibility of the instrument, in terms of increasing the ease of changing parameters and variables. Finally, INViTo increased the usability also in other fields, such as safety evaluation or social evaluation. Only ATI changed the speed of the AI and the accuracy of the model.

MARS, which is the only instrument changed even without the workshop experience, changed the visual representation of the results, the ease of playing with the instrument, the transparency of the main causal assumption and the flexibility of the instrument.

The usability for the assessment of the built environment quality, security, social and environmental feature, despite the low average score in the AI survey, was not improved.

The localworkshops constituted a test site for the AI but they were also ways to show the developers how the AIs can be used and their results interpreted in different ways according to the practitioners' backgrounds. Furthermore, the workshop template guided and showed the developers how the AI can be more or less useful in practice according to other external factors that are not strictly related to the AI itself.

Accordingly, the developers who ran the workshop were asked a specific question concerning the learning stimulus from the action on the different ways the WU can apply their accessibility instruments. Figure 9 reports the number of instruments that would be used in different ways, according to four categories of use variations.

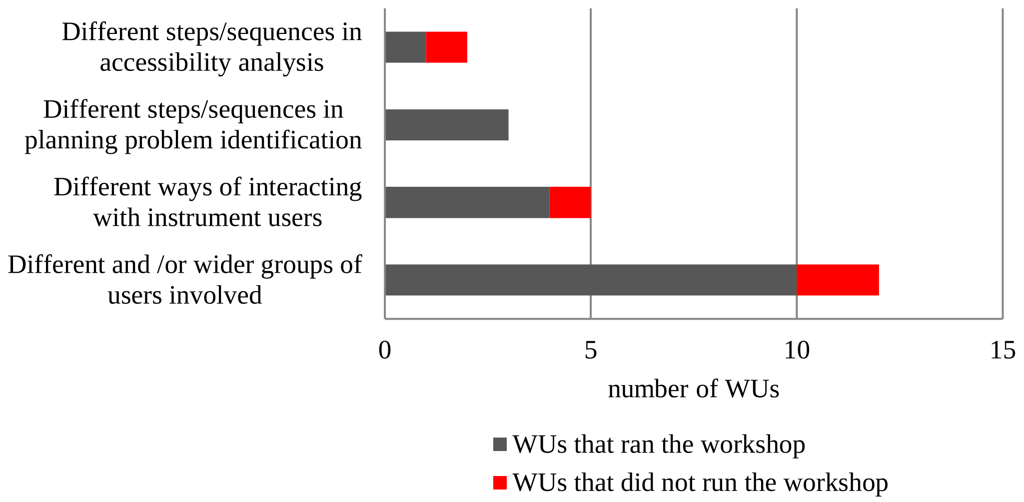

Figure 9. Number of WUs that changed the ways in which the AI was used

Interestingly, eleven WUs replied that they were going to involve in the AI application phase different, wider groups of users. In this sense the action gave the AI developers new motivations and provided new ideas in the application fields of their AIs. Five AI developers stated that they were going to use the instruments in different interaction techniques, as learned in all probability in the workshop experiences. Two WUs stated that they would use the AI at various stages in identifying planning problems and one WU at various steps in accessibility analysis. Again, what the AI developers learned is that the usability of the AI can be improved by focusing not on the accuracy of accessibility analysis, but on the interaction with users, increasing the "collaborative use" of the AI.

In particular, the SNAMUTS WU aims to engage with the community as well as practitioners, the developers of Accessibility Atlas stated that their instrument "has to be used by different stakeholders, i.e. decision makers, land use and transport planners, citizens, consultants", GraBAM developers stated that "the AI was first developed to be used only for transport planners. Now it can be more easily used also by spatialplanners", and InViTo's WU reported that "the AI can now be used also by non-experts and non-technicians".

3.3 The AI developers' perception on implementation impacts and on the barriers of the local context

The workshop also constituted an occasion for putting AI developers in contact with local practitioners involved in transport and urban planning processes. It was thus also an occasion to change AI developers' perception of the local context and the AI implementation gap.

Accordingly, a specific question in the Learning Survey asked what kind of impact the workshop had on the local context, according to AI developers. As regards the local context, 10 WUs out of 15 thought that the workshop had some positive impact on the local context (belonging to the first three categories described above). In particular, in the case of SNAMUTS, the local practitioners approached the team of AI developers to explore the impacts identified above. The Accessibility Atlas developers were asked to keep in contact with the local administration which was keen to gain further insights on specific indicators and calculations of mobility costs. As regards MoSC, the local authorities were willing to participate in joint research projects. For GRaBAM the Rome Mobility Agency was going to use the AI for additional analysis for the development of the new Urban Mobility Plan. In the case of InViTo, the AI developers were asked to collaborate further, for AAVG there is continuous collaboration and future plans to establish a regional accessibility indicator system, and finally for the instrument Travel Distribution with TRANSCAD there was ongoing collaboration with local planners.

While much has been learned, the workshops constituted a small set of experiments and the impacts we managed to measure concern only a small number of practitioners and a very specific territorial context. All WUs agree that there are still in practice many external factors which impede AI use in planning and could block the effective use of accessibility instruments in their country.

To obtain some insights, a multiple choice questionnaire with 22 different factors was administered, asking the AI developers to rate each factor in qualitative terms (Important, Slightly important, Not unimportant, Not important, Slightly unimportant, Unimportant). The types of barriers were divided into main five groups: technical barriers (Figure 10); lack of institutional standards and requirements (Figure 11); organizational barriers (Figure 12); cultural barriers (Figure 13) and political barriers (Figure 14).

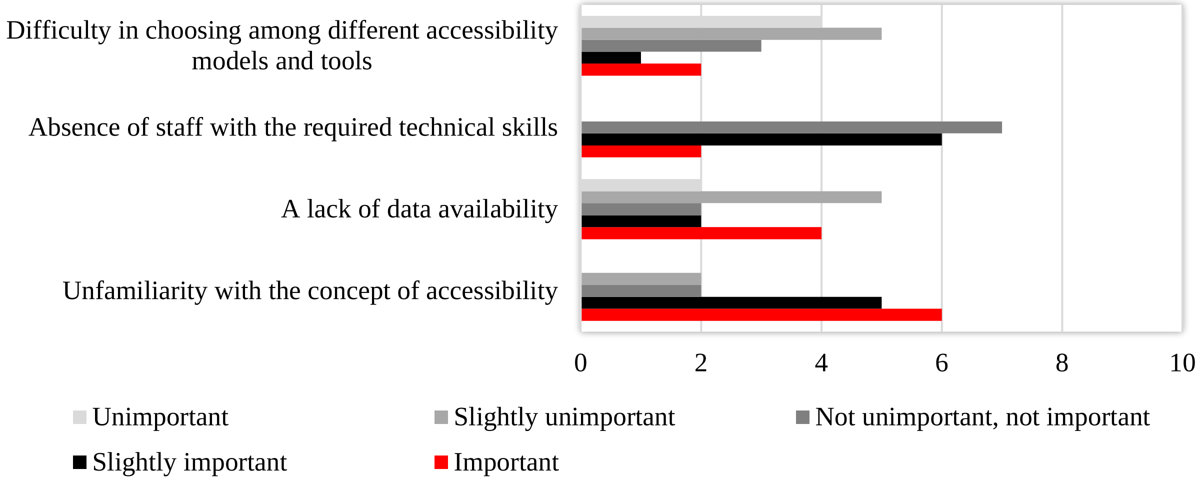

Figure 10. AI developers’ perception of technical barriers after the workshop

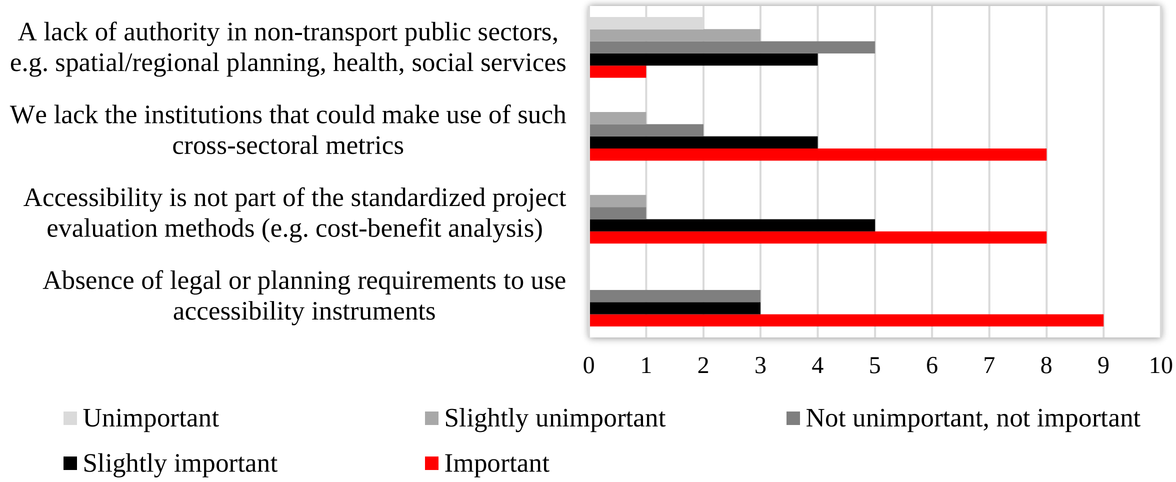

Figure 11.AI developers’ perception on legal and administrative constraints after the workshop

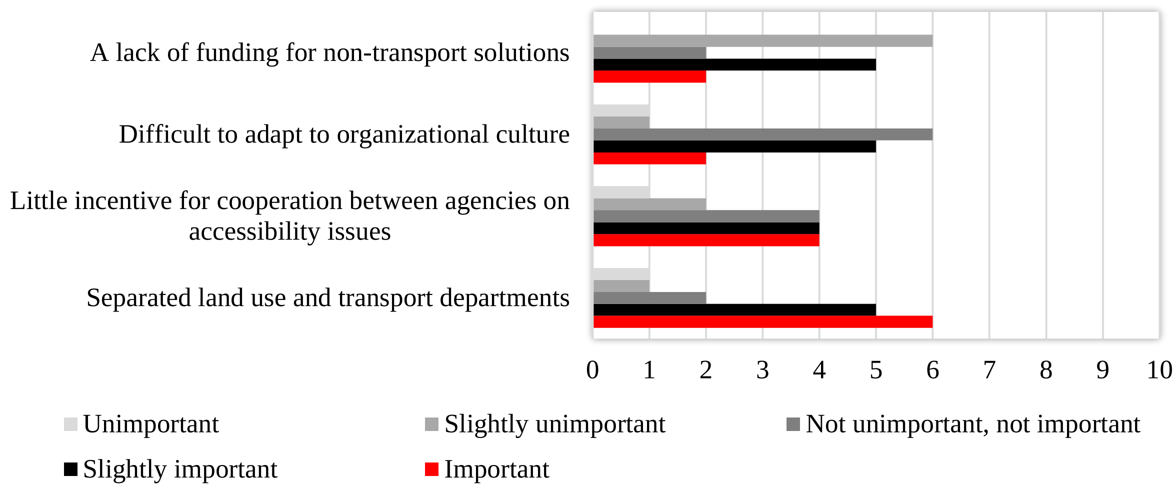

Figure 12. AI developers' perception of organizational barriers after the workshop

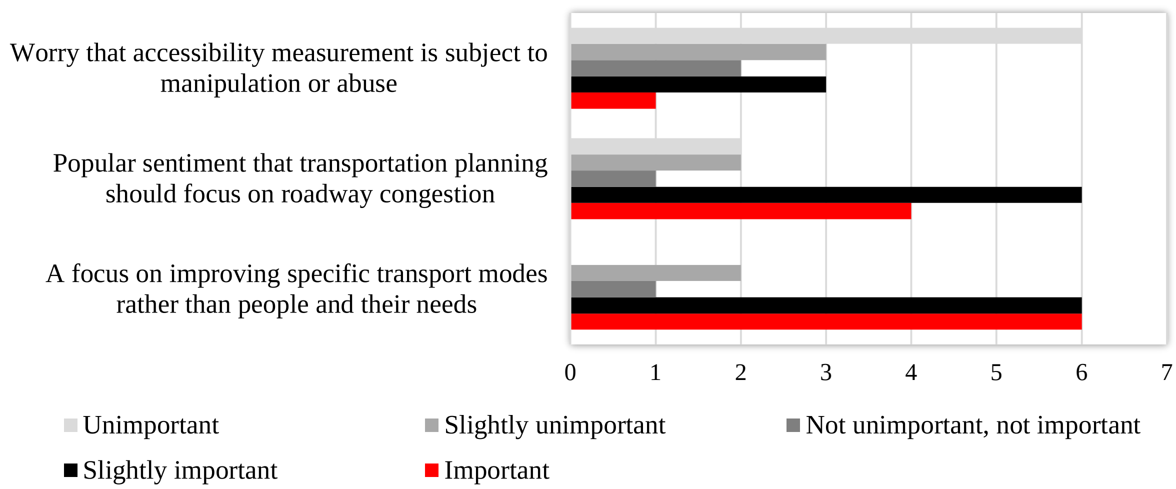

Figure 13. AI developers' perception of cultural barriers after the workshop

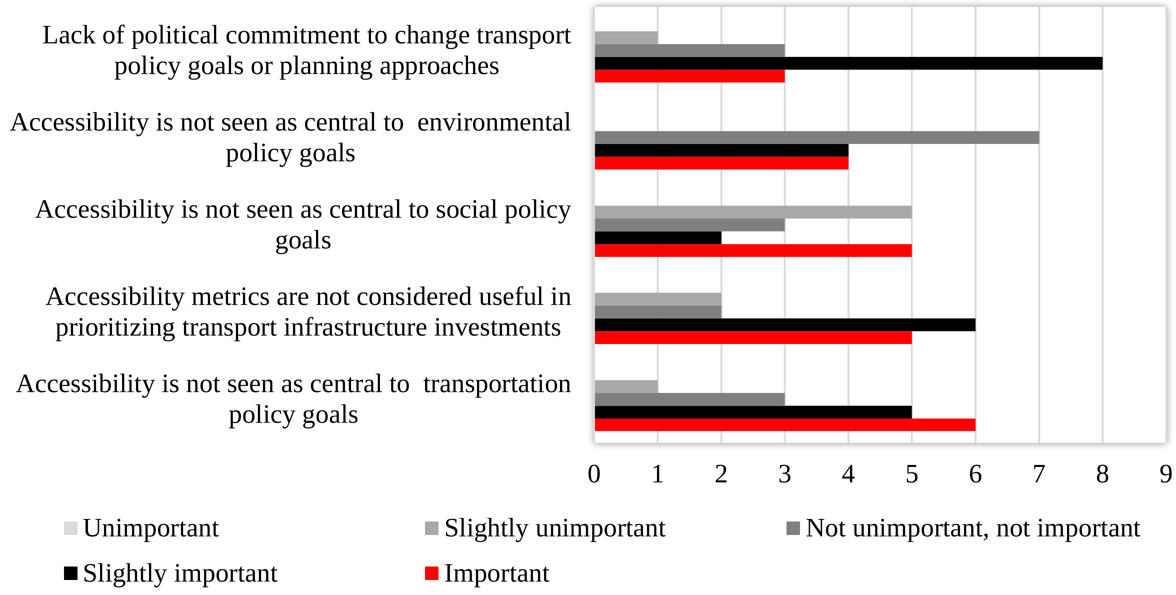

Figure 14. AI developers' perception of political barriers after the workshop

The lack of institutional requirements that force practitioners to use accessibility analysis seems to be the most important barrier according to the perception of AI developers. Technical barriers, on the other hand, do not seem to be so important as organizational and political barriers. Indeed, some AI developers stated that "*there was a great lack of accessibility standards which are obligatory only in a few countries*" or that "*data secrecy in some countries is holding back progress*".

The first five factors, which in most of the responses are set as "important" are (1) the absence of legal or planning requirements to use accessibility instruments, (2) the fact that accessibility is not part of standardized project evaluation methods (e.g. cost-benefit analysis), (3) the lack of institutions that could make use of such cross-sectorial metrics, (4) a focus on improving specific transport modes rather than people and their needs and (5) the issue that accessibility is not seen as central to transportation policy goals.

By contrast, the five factors that are seen as unimportant by most AI developers are: (1) the worry that accessibility measurement is subject to manipulation or abuse, (2) the lack of authority in non-transport public sectors (e.g. spatial/regional planning, health, social services), (3) a difficulty in choosing among different accessibility models and AIs, (4) the lack of funding for non-transport solutions, (5) the difficult to adapt to an organizational culture.

It is worth comparing these results with those of the same question (albeit in a different and more open form) administered to AI developers in the AIS survey, in the first phase of the research project and before the local workshop (Hull et al., 2012). In this research phase, AI developers replied that data availability was the most problematic issue identified, while after the workshop data availability was only in 13th place (out of 22) in the list of external barriers. This could mean that AI developers were more conscious after the local workshop experiences that the accuracy of the AI, directly related to the amount of data needed, is not as important as institutional and governance aspects related to accessibility planning.

4. CONCLUSIONS

The lack of land use and transport (LUT) integrated planning approaches in planning practice is due to substantive barriers: the cognitive distance between transport and land use planning domains and the different decision making processes and decision support tools used in the two disciplines. Accordingly, the research, conducted within the broader COST Action TU1002, developed a monitoring process to assess what the developers of accessibility instruments (AI) from both sectors may learn, and how, from reciprocal interactions.

The analysis demonstrated that the perception of the AI developers participating in the COST Action is positive: this was perceived as a useful learning occasion. In particular, the workshop experiment was rated as the most important learning occasion provided by the action, while the perception of the AI developers on the learning potential of the meeting with other AI developers was lower. With this research we showed that the COST Action TU1002 research structure can be used as a model for other research with similar aims, although more space should be left for collective presentations of the AIs or for group discussions on the single AIs.

As regards how much the AI developers learned from the COST Action experience, the fact that 10 out of 15 WUs changed their accessibility instruments demonstrates that the things they learned were also put into practice. In particular, in analyzing the altered characteristics of the AIs, it seems that changes do not concern technical improvements to make the instrument more precise (such as improved computing speed of the AI or the data needed), but mainly some characteristics to make the instrument more flexible and communicable. These two features, namely flexibility and communicability, seem to be key features which the AI developers learned that their instruments should have. Indeed, after the test experience with practitioners the AI developers understood the importance of the communication skills of their AI rather than the accuracy and complexity of calculations. In this sense, the COST Action gave the AI developers new motivations and provided new ideas in the application fields of their AIs. In other words, our analysis shows that AI developers learned that improved usability of the AI can be increased by focusing not on model accuracy, but on the "collaborative use" ability of the AI.

Finally, according to developers' perceptions, the structured workshops may have some positive impacts on the local contexts in revising ongoing projects and plans in light of improving accessibility (more than travel speed), as in the case of GRaBAM, and in showing the potential of accessibility analysis in planning practice, as in the case of SNAMUTS. Nevertheless, external factors that impede AI use in planning practice still exist. The lack of institutional requirements that force practitioners to use accessibility analysis seems to be the most significant barrier. Technical barriers, on the other hand, do not seem as important as those of an organizational or political nature.