

Article

Working with the Society and for the Society: A Different Way to Run a Cultural Informatics Lab

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Abstract: Founded in 2014 and formally established in 2017, the Knowledge and Uncertainty Research Laboratory (ΓAB LAB) is active in a wide range of research fields, with cultural informatics being the most prominent one. The laboratory is rather unconventional, in the sense that it deviates from the typical notion of a research laboratory and follows a more open approach, with more and wider collaborations. In this work, we discuss the way the laboratory works closely with three different public sectors, namely the Ministry of Culture, the Ministry of Education and the Local Government, as well as with a larger part of the university's community. We explain the opportunities that arise from this approach and present the challenges that come with them. We find that whilst this approach in the short run has little impact on the most commonly used KPIs for research laboratories, such as publications and received funding, it has a major impact in other directions such as practical impact of the research in the society and academic development of the students. Benefits are also identified for the more conventional research objectives, in the longer run.

Keywords: cultural informatics; research; education; application; collaboration

1. Introduction

The Knowledge and Uncertainty Research Laboratory, or ΓAB LAB as it is more commonly known, is a research laboratory, established at the Department of Informatics and Telecommunications of the University of Peloponnese. It comprises more than 40 members, including professors, researchers, doctoral candidates, postgraduate and undergraduate students, laboratory staff and volunteers [1].

The character of the Laboratory is interdisciplinary, with the research interests of its professors and researchers embracing various fields of computer science as well as psychology, pedagogy, archeology and history. Given the number of members and the variety of their research interests, it follows naturally that ΓAB LAB pursues a wide range of research (and other) goals. However, cultural informatics, or more specifically the utilization of technology towards better understanding and accessing our cultural heritage, is the leading and core field of work. Research efforts outside cultural informatics include smart cities and education; it is not uncommon for these research efforts to at times find common ground or application in the cultural domain as well.

Besides being interdisciplinary, the lab is also unconventional in the way it operates, in the sense that it puts emphasis, effort and resources into building and maintaining cooperations spanning from research groups to private and public entities of various domains and into pursuing goals that are not related to core research—such as bringing science closer to young pupils or promoting innovation in the region. We also differ from the norm in the way to interact with younger students. Undergraduates are invited to participate in core research operations of the lab, starting from the very first year of studies—with varying degrees of involvement as the students gather more experience and technical knowhow. Finally, we provide most of our technical products for free use by our partners and the broader community rather than aiming at their financial exploitation.

A question that naturally arises is what impact these differences in the way the lab is organized have on its operation and achieved results. In this work, we focus on the cooperations the lab maintains with the Ministry of Culture, represented by the Ephorate of Antiquities of Arcadia, the Ministry of Education, represented by the Regional Directorate for Education of Peloponnese and the Local Government, represented by the City of Tripolis. We discuss the opportunities created and the challenges faced and examine the results that this mode of operation has produced. In a similar manner, we also examine the impact of the different approach towards undergraduate students.

In order to assess the operation of the lab and its achieved results, we use as reference the achievements of other labs of our department, namely the Algorithms, Cryptography and Computational Logic lab, the Communication Networks and Applications Laboratory (CNA Lab), the Computer Systems Laboratory and the Optical Fiber Networks and Systems Design and Development Laboratory. These labs are organized in a more conventional manner, with a group leader dictating the research directions, other professors and senior researchers contributing to the research and limited external interaction beyond the participation in multi-partner funded research projects. These are groups of similar size and operate in the same legal and financial framework, thus providing an excellent reference for comparison and evaluation.

Our results are quite conclusive: this alternative mode of operation reflects in fact a different type of research lab, with different goals. Should one embrace the goal of maximizing the impact research has in society, this is the path to follow. Should, on the other hand, one wish to focus more on research output as measured in publications and attracted budget, then our approach may or may not have an impact, at least in the short run. In the long run, though, there are important benefits for the conventional lab as well, as the development of more and better researchers is facilitated, thus addressing the problem of finding and attracting competent collaborators.

The remainder of the document is organized as follows: In Section 2, we present the lab's collaborations in the field of cultural informatics and the opportunities that arise from them and in Section 3 we discuss the challenges that come with them. In Section 4, we examine the results from the lab's alternative mode of operation, in research output, societal impact, educational impact and recruitment. Section 5 lists our concluding remarks.

2. Partnership

We believe that a lot can be gained by combining expertise and examining different points of view. Thus, in every domain in which we are energized, we strive to partner with the people, institutions and stakeholders that are the most relevant, so that we can exchange know-how and combine efforts. Some of our long lasting partnerships are listed below, while more partnerships are currently being set up or have been established recently.

2.1. Ephorate of Antiquities

The Ephorate of Antiquities of Arcadia is the representative of the Ministry of Culture in our region. It is in charge of every archaeological and historical site in the region as well as of all the local archaeological museums. It is also the only regional institution that can issue permits for the execution of any type of work or publication that involves cultural heritage items that belong to the state.

Our partnership with the Ephorate is central to our research in cultural informatics. It allows us to have access to real museums, of different volumes, budgets and types, and facilitates access to archaeological items and data. Perhaps more importantly, it provides us with insight (via exchanges such as the one in Figure 1) regarding the way archaeologists and museologists see their field and the challenges they face [2].

This cooperation, in addition to new ideas regarding what is needed, also provides us with a higher level of validity for our research results, as our tools and applications are not designed by engineers and tested by students, as is often the case, but co-designed by archaeologists and tested by real users in the actual museum setting [3].

Our students also have benefits, as they get to work on these that are not only considered from a theoretical point of view but are also applied and tested in real-life settings in the various locations controlled by the Ephorate.



Figure 1. Meeting with the Ephorate of Antiquities’s archaeologists.

2.2. Regional Directorate for Education

We strongly believe that, whilst administratively three distinct levels exist, in essence, education is one. We aim to work closely with primary and secondary education schools, providing insight regarding what university really is and what pupils should expect to find there or get from it. We also invest a lot of effort towards stimulating pupils towards science and innovation, as well, of course, towards the wonders of applying informatics in the domain of cultural heritage. An example of such an activity is presented in Figure 2.

Our partnership with the Regional Directorate for Primary and Secondary Education of Peloponnese, which is the representative of the Ministry of Education in our region, gives us access to a huge number of schools and pupils.



Figure 2. Showing pupils what AR is and how it could be used in the cultural domain.

It also brings us closer to the educators, facilitating our research in education and educational software systems, as we have the opportunity to see and incorporate the teacher's view and insight already from the phase of theoretical design.

Our students benefit in various ways, including having the opportunity to assume the role of the educator and pass on the knowledge to the next generation and, of course, working on educational content and software under the guidance of teachers and via the validation of user tests that involve pupils.

2.3. City of Tripolis

One of the laboratory's research topics is that of smart cities. Of course, there is little point in researching smart cities without having a city whose point of view to examine and on which to apply the results of the research. Our partnership with the municipality of Tripolis, signed into effect this February (see Figure 3), allows us to focus on research for smart cities with small budgets and limited existing infrastructure, a niche that has received little attention so far, but can be expected to come into focus in the future as it relates to the majority of cities in the world.



Figure 3. Signing a partnership agreement with the City of Tripolis.

The City of Tripolis owns some minor local museums but is also involved in a large number of folklore events that are organized round the year. Through our cooperation, we have the opportunity to propose smart applications for such events and also try them in real life.

We find that the cooperation between an academic entity and the local government generates a huge potential to motivate people. As a characteristic example, we recently assisted the city of Tripolis in participating in a nationwide innovation competition, focused on proposing smart solutions for local government, including the management and exploitation of cultural resources. The result was that, in Tripolis, corresponding to less than 0.3% of the country's population, the public was so motivated that the region generated almost 30% of the proposed ideas (33 out of 114 nationally).

Our students benefit from the opportunity to work in a local government setting and see what extra steps are needed to go from idea to application when bureaucracy becomes a factor.

2.4. Collaboration Structure

A brief visual summary of the lab's cooperations is provided in Figure 4. The outgoing arrows indicate the additional efforts (with respect to the more conventional laboratories) that the lab is undertaking and are seemingly unrelated to research. These include developing and providing applications for the local museums, giving presentations in schools, serving as a technical consultant for the municipality and developing applications for the city.

However, then we have the incoming arrows, indicating benefits produced by the lab's cooperations that are actually directly related to its purely research activities. These include data, insight and real life application test beds for cultural informatics, smart cities and educational informatics—thus achieving a sort of return on the lab's investment.

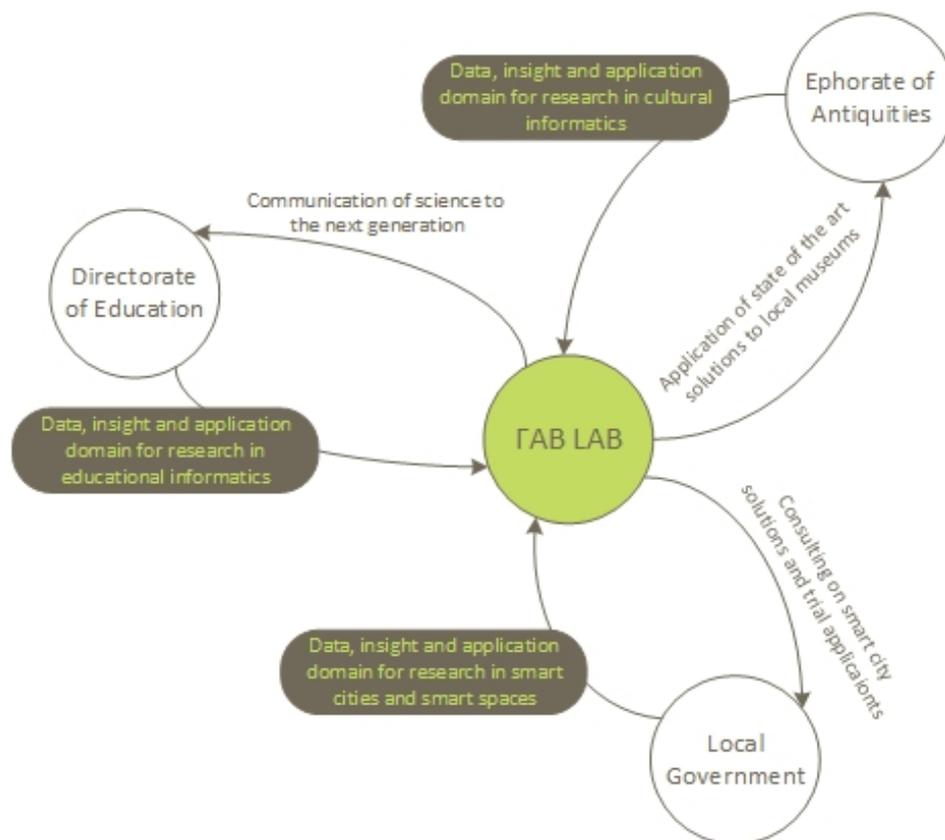


Figure 4. Visualization of the lab's external cooperations.

2.5. Innovation Centers

We believe that a university offers the most when it is not secluded away from society but rather in close connection with it. In this direction, we are developing a network of innovation centers throughout the region of the Peloponnese.

The goal of these centers is to serve as the connecting point between the laboratory and the society. The place where citizens can come asking for solutions to practical problems, businesses can also come looking for marketable innovations and hopeful startups can come for consulting and support.

In this effort, we are supported by the City of Tripolis and other cities in the region, the Regional Directorate for Education and private companies.

2.6. Mix and Match

In the previous paragraphs, we have presented different partners that we have as individual and independent collaborations. The reality is more complex, as we strive to include them all whenever and wherever possible and combine their input and insight, as seen in Figure 5.



Figure 5. A meeting with regional stakeholders of culture, including researchers, local government, educators and museum directors.

Thus, we see all of our collaborations as one, a network of people that can provide valuable and previously unavailable insight into what would be useful, what might work, what limitations and special conditions need to be taken into consideration. We find that being truly interdisciplinary, i.e., involving people with a common interest but vastly different backgrounds, is the only way to truly move forward in a field such as cultural informatics. The combination of different backgrounds, we should point out, does not refer to the cooperation between researchers of different scientists—in the end, all are researchers; it refers to the vivid discussion between researchers, entrepreneurs, practitioners, NGOs, public bodies and the general public.

3. Challenges

The unconventional nature of the laboratory is both a strength and a weakness. It contributes to achieving many of our goals, such as performing relevant research, seeing our research applied in real life settings, promoting science and particularly cultural informatics to younger ages and providing more opportunities for our students. At the same time, it also poses some unique challenges.

The funding schemes that are addressed to research laboratories target the activities that are typically expected by such an entity, such as basic and applied research and, in some rare cases, training of students and professionals. Thus, when a research entity hopes to venture to new, atypical operations, no funding schemes are available to support them.

Our main challenge is how to continue supporting actions such as working with primary and secondary schools, and fund efforts such as the network of innovation centers. We do this by diverting some of the income that is generated by our conventional operations, such as the participation in Research and Technical Development projects, but are on a quest to identify a more sustainable and extensible way to fund these operations.

Involving undergraduate students in the research process is also a challenge, as it requires considerably more time and effort from the part of the senior researchers to achieve the same goals. Thus, in the short term, it limits what we can achieve.

Involving stakeholders and non-researchers early in the research process also requires time and effort from the part of researchers. There are cases when a common ground and language are hard to find; in such cases, the common ground and common language need to be developed from scratch, a process that is particularly time-consuming.

Finally, this approach inadvertently involves a huge number of people in the operation of the lab, ranging from internal members such as researchers and students, to externals such as teachers, archeologists, entrepreneurs, administrators and politicians. Thus, managing the lab and keeping all people, projects and tasks in check and working smoothly is a challenge in itself.

Of course, these are not the only challenges we face. Similarly to any other lab, we also face the typical challenges faced by all researchers. The reason this document focuses mainly on funding challenges is that these are the challenges that are related to the lab's unconventional organization. Regarding the other types of challenges, there are no differences when compared to other labs and thus there are no lessons learned that would be of interest/benefit and worth sharing.

4. Results

In science, we know that, in order to assess something, we first need to define clear and objective measures, ideally ones that accurately represent the degree to which the examined results achieve the intended goals. Whilst this is rather straightforward when examining an algorithm or a system, it is a bit more complex when assessing the overall operation of a complex structure that involves humans, as is the case of a research laboratory. Of course, it all starts with the definition of the goals themselves.

4.1. Research Output

The conventional goal of a research laboratory is the implementation of research projects and the production of research outputs. Typical KPIs used include number of projects, total budget attracted, number of publications and citations, awards achieved and so on [4].

In this direction, ΓAB LAB has performed excellently in the time since the "open" direction was followed. During the last year, ΓAB LAB has secured funding for four new projects, whilst the other nine research laboratories and groups in the department have secure funding for three more projects cumulatively (to the best of our knowledge). We have also performed better than what the members of the lab achieved individually in the years before the establishment of the group, as the cumulative number of funded projects was less than one per year. We have also seen a rise in number of published papers, approximately about 50% more than a few years ago.

To have a more clear and quantified view of our performance, we have collected the publications of the six members of the lab, as reported in Google Scholar, before and after the establishment of the lab. We acknowledge that Google Scholar does not give an absolutely accurate quantification as there are some mistakes; the reason we follow this approach is that in Google Scholar we can also check how members of other labs have performed over the same period of time, thus having a way to compare against a reference.

In Figure 6, we see how the average number of publications for lab members raised from less than 2.5 papers per year before 2014 to more than three papers per year after the establishment of the lab. Please note that the lab was founded in August 2014, with its first articles achieving publication in 2015. The raw data that produced this graphic, and the next one, are listed in Appendix A and can also be verified in Google Scholar.

One fair question would be to examine whether this rise in publications represents a broader rise in publications in our environment. To assess this, we have examined in the same way (via Google Scholar) how the senior members of the other labs of our department have performed. From this, we have excluded the researchers that are also members of ΓAB LAB and those that do not have profiles in Google Scholar. We see in Figure 7 that our peers do not show the same rise in scientific production—quite the contrary, there is a fall in published works, which is unfortunately typical in Greek research entities over the last several years and may be linked to the financial crisis and the

inability to conduct research and/or fund its presentation in conferences or publication in journals with article processing fees.

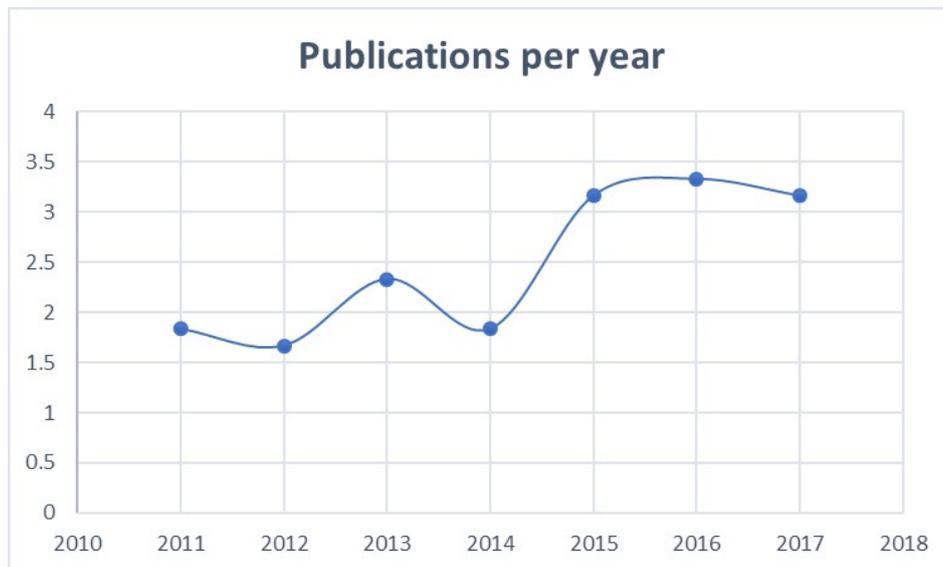


Figure 6. Average number of publications for senior members of the lab.

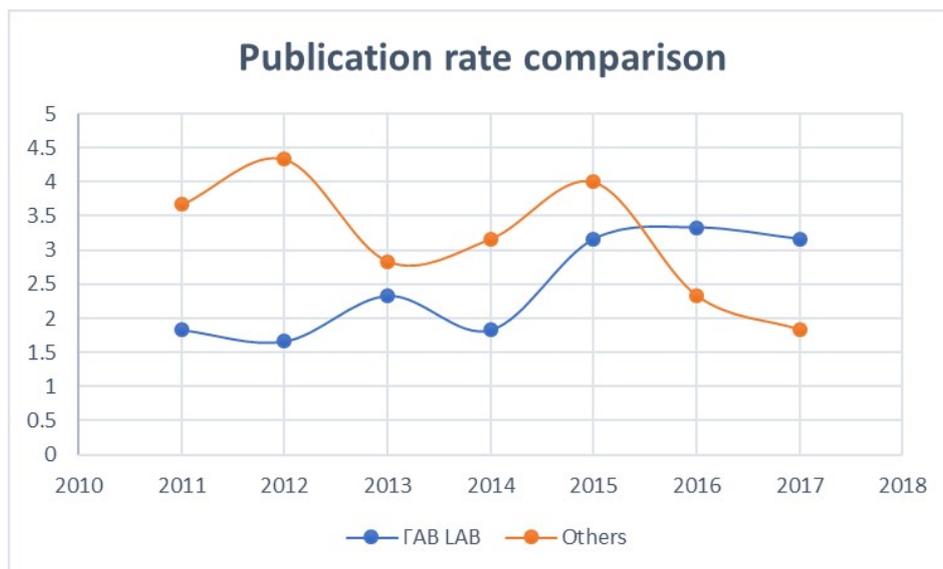


Figure 7. Comparison to the publication rate of other labs in our department.

We are careful not to read too much into the above results. Regarding the funded projects, proud as we may be for them, we should note that our non-research partnerships were not involved and these colleagues did not contribute to the proposal texts. Thus, we cannot safely conclude that it is our unconventional mode of operation that has contributed to this success.

Similarly, we are pleased to see our publication count rise, but this may be linked to the larger number of projects that facilitate the production of results. Actually, when examining in detail the publication records, we see that the majority of the additional publications are in conferences and book chapters and the raise in the more respected journal publications is considerably smaller, if any at all.

We have been as keen as always to produce and publish in journals and the additional projects should have led to a higher number of such publications. However, the senior members of the group have had much less time to do so, thus having a reduced number of submitted manuscripts. In part, this may be linked to reaching a more senior stage in our careers and thus having more administrative

tasks and in part to us having to dedicate a portion of our time in our unconventional activities, such as working with schools and integrating undergraduates in the research process.

It is worth mentioning that there are a considerable number of papers that are co-authored by undergraduate students. However, they are all based on ideas of the more senior researchers and the undergraduates' contributions not being critical. In fact, all such publications would have been done even if the undergraduates were not involved, with the exception of one conference paper that is partially based on software that was developed as part of a thesis. Therefore, the participation of undergraduates in the research process may have produced papers with their contribution but has not produced more papers overall than what would have been achieved if they were not involved.

Overall, we see that the laboratory has seen a rise in the KPIs that are related to the conventional tasks of a research laboratory, but we cannot yet safely conclude that this is linked to the unconventionality of its structure. Quite the contrary, if anything, this different mode of operation has hurt our short-term research output as it has had a cost in the time of the more senior researchers.

4.2. Societal Impact

The societal impact of our work is harder to quantify, but a qualitative assessment is possible. We assess our impact by observing what our partners have achieved that may be linked back to our contribution.

The Archaeological Museum of Tripolis hosts a collection that is of archaeological importance for the region. However, it is hosted in an old and damaged building and has not been redesigned for more than two decades, having a museological approach that is not relevant anymore. Visitors were rare and until recently most locals had never visited it and some did not even know where it is located (it is actually at the city center).

By using the museum as our test bed and also letting students use the museum as the object of their theses, through our cooperation with the Ephorate of Antiquities, we have had a number of side-effects. First of all, researchers and students became familiar with the museum. The public has also become more aware of the museum, as they have been invited on various occasions to participate in experimental sessions. Finally, the museum potential has been augmented too, as the tools and applications that have been produced from our work are now at its disposal. As such, the museum now has an electronic guide that connects to Facebook to gather personalization information and customize the presented content, an augmented reality application that uses the Google cardboard as seen in Figure 8 and new narratives that connect its exhibits to others in museums all over Europe. Should we have developed these tools on our own, without closely consulting with the stakeholders that will use them, they would probably be less suitable for practical application—and also the stakeholders would be less aware of their existence.

We also see our impact in the way that the administration of the Ephorate now embraces technology and looks for new ways to incorporate both in the internal operations and in the way the cultural capital is promoted and presented to the public.

Regarding our cooperation with the Regional Directorate for Education, our connection to the schools has been highly rewarding. Our feeling is that we have provided pupils with a new insight regarding the subject of cultural informatics and its exciting potential, via events such as the one seen in Figure 9. Still, whether any real impact has been achieved will only be measurable after several years, when these children grow up, if someone examines whether their approach to culture and heritage has deviated from the average. Thus, we cannot offer any strong indication that our work with the schools has the long-term societal impact that we hope.



Figure 8. An AR guide for the Archaeological Museum of Tripolis, based on the Google Cardboard.



Figure 9. In a secondary school classroom, promoting science.

Regarding our cooperation with the City of Tripolis, similarly to the cooperation with the Ephorate, we see that technological solutions are all the more commonly considered when designing new actions of cultural interest. Still, none of these plans have as of yet been implemented by the city. Thus, whilst we see a potential for our work to reach the public, we have not yet had the pleasure to see this become a reality in the cultural domain. But we have seen our ideas in the domain of smart cities implemented and awarded by the Council of Europe Best Practice Programme, and we have strong positive feedback for our outreach activities, as the one in Figure 10, so we have a hope that our culture related ideas will eventually also find their way to realization.

Overall, we see a clear impact in the way the Ephorate operates and especially in the operation of the Archaeological Museum of Tripolis and its appeal to the public and we have reason to believe that we will achieve an impact in the way the city handles its cultural heritage. With respect to our work with the schools, we do not have a way to assess whether a long-term societal impact is achieved.



Figure 10. On the radio, promoting innovation in the city of Tripolis and the broader region.

4.3. Educational Impact

Cultural informatics is not offered as a topic in the undergraduate program of our department and is only available as a single elective course in the graduate program. As such, in the past, most students would graduate without having ever heard the term cultural informatics, let alone having acquired any skills in it.

With research internships offered from early on, thesis topics available in the field and the opportunity to work directly with museums, archaeologists and museum personnel, cultural informatics is now a hot topic in the undergraduate program. Students come to meetings, participate in experiments, volunteer to events and choose culture as their thesis topic more often than any other topic in the department. As a result, the majority of our students are now aware of the field and have a general understanding of what is involved and many also develop skills either via working on a related thesis or via contributing to a research project.

Similarly, neither smart cities nor educational informatics are examined in our undergraduate program; the former is offered only in the graduate program, and the latter is not offered at all. Since we established the cooperation with the city and the schools and started offering students the opportunity to volunteer for events or undertake related theses, awareness and skills have become more common.

Overall, we believe that we can safely conclude that the involvement of students in the research process from early on has had clear and measurable benefits in their academic development in cultural informatics and relevant fields.

4.4. Recruitment

Any research director knows that attracting the best researchers is the key to prolonged and sustained success. In Tripolis, this has always been a challenge, as funding is usually scarce and, with the university being away from Athens, researchers are also hard to come by.

We have found that it is easier to attract senior researchers, but this may be linked more to the fact that we now have the funds to support them than to a difference in the way we operate. However, we have seen another way that our cooperations assist us in having the best researchers.

By giving undergraduate students an opportunity to be involved in research, potentially adding publications to their CV, and working in real work environments in fields in which they might one day find employment, we have become a popular thesis destination. A thesis is a required course for graduation from our department and we see over the last several years that more than half of the graduating students first ask for a thesis topic at ΓAB LAB. We choose some to work with and the rest then move on to the other laboratories in the department to explore alternative options.

We, thus, have the chance to choose the best. Having them involved in research from early on means that, should they stay with us for a masters and then a doctorate degree, they will accumulate important research experience through many years of active research work.

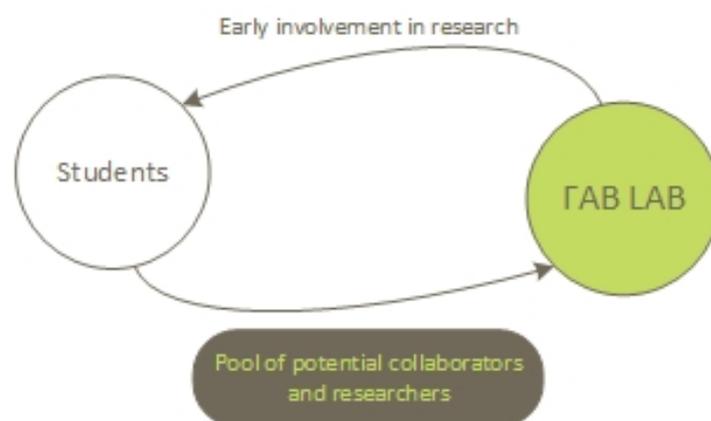


Figure 11. The mid- to long-term model of the lab's interaction with younger students.

Thus, overall, although our approach does not necessarily assist us with recruiting good researchers, it assists us in recruiting good students and developing them into good researchers, providing us with an alternative, long-term solution to the problem, as explained in Figure 11.

5. Conclusions

Whereas the senior members of the lab all have experiences from the more conventional way of operation of research laboratories, at ΓAB LAB, we have opted to follow a different, rather unconventional approach. Core areas of differentiation from the norm include:

- Establishing and investing in collaborations with stakeholders and non-research organizations.
- Directing laboratory resources towards popularization of science, both for schools and the broader public.
- Involving undergraduate students in large numbers in the core operation of the laboratory, including the research related tasks.
- Sharing findings and tools rather than following a path of patenting and financial exploitation.

In this way, we have developed a new type of entity within the university; one that is not solely focused on producing research.

Our main finding is that whilst this alternative form of operation poses some challenges in funding and has a rather small impact regarding the conventional research KPIs, at least in the short run, it provides a huge benefit in the broader goal of maximizing the impact of scientific work in the society, with beneficiaries ranging from pupils and students to the public institutions and the broader public. It also provides a benefit in the conventional research KPIs in the longer run, by enabling the development of more and better cooperating researchers.

We feel that making a positive impact in society is an important part of the the core mission of a university and of its components. For this reason, we are happy to undertake the overhead and face the challenges that come with this unconventional mode of operation. We also feel that our approach is not particular to cultural heritage and we hope to see more colleagues adopting the approach in the future, not only in cultural heritage but also in other fields.

This may also lead to a larger body of literature on the subject, one that will allow us to fine-tune and optimize the way we, as researchers, interact with our surrounding communities and feed our results to them.

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Conflicts of Interest: The author declares no conflict of interest.

Appendix A. Publication Data Used in the Quantitative Evaluation

In Table A1, we list the number of publications for several members of our department, as provided by Google Scholar on 23 September 2018. We note that Google Scholar does not give an absolutely accurate quantification as there are some mistakes; the reason we follow this approach is that, in Google Scholar, we can also check how researchers who are not members of our lab have performed over the same period of time, thus having a way to compare against a reference.

Wallace, Vassilakis, Tryfonopoulos, Platis, Pouloupoulos and Karapanagiotou are the senior members of ΓAB LAB. Masselos, Tselikas, Sagias, Malamatos, Kolokotronis and Politi are members of the other labs of the Department of Informatics and Telecommunications of the University of Peloponnese.

Table A1. The raw data used in the evaluation

Researcher	2010	2011	2012	2013	2014	2015	2016	2017
Wallace	4	2	4	4	2	4	7	6
Vassilakis	7	8	5	7	4	4	9	10
Tryfonopoulos	0	1	0	3	2	5	3	1
Platis	0	0	0	0	1	4	0	1
Pouloupoulos	6	0	1	0	1	1	1	1
Karapanagiotou	0	0	0	0	1	1	0	0
Masselos	4	8	10	4	2	3	3	2
Tselikas	3	3	3	4	5	6	2	4
Sagias	6	4	1	2	6	4	4	3
Malamatos	1	0	0	0	0	1	0	0
Kolokotronis	1	6	3	2	3	4	4	1
Politi	5	1	9	5	3	6	1	1

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