Modern Technologies in Polish Archaeology: A Case Study of Central Masovia 2009 – 2014

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Abstract

The aim of this paper is to enrich academic discussion about broadly understood "modern" or "new" technologies in Archaeology by assigning actual facts and statistical information to various claims and propositions circulating in Academia. Further, to inform exactly how many researches of different types took place in the 2009-2014 period and in each year of this period, which method is most popular, and if there are any general tendencies to be noticed in the usage of particular methods. Authors use as a base for this case study an area of nine counties in central Masovia region (Poland), which is moderately enriched by objects of archaeological importance, yet where a consistently high number of private and public investments causes steady increase in number of archaeological projects to be carried out in recent years. These are conducted on a different scale from one-day watching briefs up to road scheme projects covering large previously underdeveloped areas around the city of Warsaw and are carried out both by local archaeological teams and units from other parts of the country. A common factor is almost exclusively commercial character of work, also an important background is created by the EU funds inspired a boom in infrastructural investments that will most likely be the largest event of such scale for many years to come. Data presented here is collected from all field reports and documentation collected on a basis of art. 31.3 of Polish Monument Care and Protection Act by Masovian Voivodship Heritage Officer Office for the period of 6 years (2009 - 2014). The paper does not aim to discuss the quality of such work or validity of chosen methods for the projects they have been used in – this is a matter for another study. Neither it is the authors aim to qualify, which method is more suitable for future use in the field archaeology in this region. This report should be treated as a factual base for future discussion and an attempt to present the condition of Polish Archaeology in its certain aspect.

Keywords: *LiDAR, Photogrammetry, GIS, archaeology, technology.*

Streszczenie

Celem niniejszego opracowania jest wzbogacenie dyskusji akademickiej na temat szeroko rozumianych "nowoczesnych" i "nowych" technologii w archeologii przez dodanie rzeczywistych faktów i danych

statystycznych dla poszczególnych założeń i twierdzeń krążących w środowisku akademickim. Ponadto podanie informacji, ile dokładnie, jakiego rodzaju badania miały miejsce w latach 2009–2014 oraz w każdym roku tego okresu, która metoda jest najbardziej popularne, oraz, jeśli zauważalne są jakieś ogólne tendencje w kwestii poszczególnych metod. Autorzy wykorzystują jako bazę do niniejszego studium obszar dziewięciu powiatów w centrum Mazowsza, zawierający statystycznie umiarkowaną ilość znaczących zabytków archaeologicznych, gdzie jednak konsekwentnie duża liczba inwestycji prywatnych i publicznych powoduje stałą, wysoką liczbę projektów archeologicznych przeprowadzonych w ostatnich latach. Są one prowadzone w różnej skali od jednodniowych nadzorów archeologicznych do szerokopłaszczyznowych badań wykopaliskowych związanych z projektami drogowymi, obejmujących duże, dotychczas słabo rozwinięte obszary wokół Warszawy i są prowadzone zarówno przez lokalne zespoły, jak i jednostki archeologiczne z innych części kraju. Powtarzającym się czynnikiem jest prawie wyłącznie komercyjny charakter pracy, natomiast ważnym tłem jest swoisty "boom" na inwestycje infrastrukturalne w dużej mierze finansowane ze środków Unii Europejskiej będący wydarzeniem, które najprawdopodobniej nie zostanie powtórzone na taką skale przez wiele kolejnych lat. Przedstawione tu dane pochodzą ze wszystkich raportów i dokumentacji terenowych [badań archeologicznych] zebranych na podstawie art. 31 ust. 3 ustawy o ochronie zabytków i opiece nad zabytkami za okres 6 lat (2009 - 2014) przez Mazowieckiego Wojewódzkiego Konserwatora Zabytków. Artykuł nie ma na celu omówienia jakość tych prac lub trafności wybranych metod dla projektów, w których zostały one wykorzystane – jest to sprawa dla innej analizy. Nie jest celem autorów kategoryzowanie, która z wykorzystywanych metod jest bardziej odpowiednia do użycia w ramach poszczególych badań archeologicznych. Raport ten powinien być traktowany jako podstawa faktyczna dla przyszłych dyskusji i próba przedstawienia stanu polskiej archeologii w pewnym jej aspekcie.

The subject, although very popular and widely mentioned in the academic discussion, remains elusive and not defined. There is no definition of „modern technologies" in archaeology, yet almost every archaeologist active in commercial or research archaeology or working in heritage protection does insist that he or she is familiar with the term and current state of affairs. For the purpose of this paper, it has been decided, that the best approach is to present a list of most popular technologies and trace their usage (popularity) in a certain region and in a limited timeframe. The information gained should be up to date as much as it is possible, thus only newest projects would be taken into account.

The authors of this paper decided to utilize a unique opportunity created by their workplace. Masovian Voivodship Heritage Officer Office (WUOZ) is a government institution and a part of civil service in Poland, one of 16 such administrative bodies existing within the country. WUOZ is carrying out the duties of Masovian Voivodship Heritage Officer - MWKZ – a person who is personally responsible for protecting monuments in a Voivodeship. His or her duties are described in Polish Monument Care and Protection Act (Art. 89 and 91). MWKZ is, in turn, carrying out duties of Wojevode. There are many departments within WUOZ including Department of Archaeology.

Accordingly to Article 36.1.5 of Polish Monument Care and Protection Act (Dz. U. 2014 poz. 1446 ze zm.) WKZ trough his office - WUOZ is, among other duties, issuing permits for every archaeological field research in given region (Voivodship or it's

part if a WUOZ delegacy is created in another part of the Voivodship). Thus the area subjected to this analysis is same as Central Part of Masovian Voivodship with the exception of Warsaw City Area and Żyrardów City Area and is constituted of 9 counties: Nowodworski, Wołomiński, Legionowski, Otwocki, Piaseczyński, Pruszkowski, Grodziski, Żyrardowski (Without the town Żyrardów) and Warszawski Zachodni.

It should be noted that the same Monument Care and Protection Act allows for WKZ to delegate some of his duties to municipal authorities thus local offices have been created by Warsaw City Hall, Żyrardów Town Hall and Nowy Dwór Mazowiecki Town Hall. These offices are responsible for care and protection of all heritage within their municipal borders accordingly to specific treaties signed with WKZ, with the exception of Nowy Dwór Mazowiecki where Archaeology has not become a part of municipal conservator Office responsibility but rather stayed with WKZ.

Archaeological fieldwork is only legal when it is conducted accordingly to a valid permit issued by WKZ specific to given area. Art. 31.3 of the same Act states that a set of documentation is to be deposited to WUOZ after each project. Thus, authors basic assumption is that WUOZ is currently in the possession of field reports and documentation from all research conducted in line with legal regulations within the area, thus the survey of these documents is bound to be as comprehensive as it is possible.

Timeframe to which the analysis is applied - a period of 6 years from 2009 to 2014 is a matter of - to some extent subjective – choice of the authors. Aforementioned Polish Monument Care and Protection Act gained legal power in late 2003 and thus by the year 2009 all research started with permissions issued on the basis of previous regulations would have had ended. Additionally years 2006 – 2008 mark a turning point Polish commercial archaeology. For the reasons that should be a matter for another article, Polish commercial archaeology market truly opened (for good and bad); the number of research has increased but at the same time drastically decreased the number of field projects conducted by traditional large research institutions like museums and University based Archaeology Institutes.

By 2009 already most of the field research was conducted by small private units very often-employing just one person. This situation is still "standard" today in 2016. On the other hand, the year 2015 was hard, to sum up since some rare projects still continue today (early November) and the directors do have 6 months to submit documentation after the project is concluded. Authors decided also not to include all the projects for the period after 1989 in order not to be overwhelmed by the quantity of data.

Majority or data used for this particular study comes from reports and documentation of unpublished archaeological research. Although legally archaeologist conducting archaeological research is entitled to present (apart from initial excavation report and set of documentation) a written "study" of fieldwork results and archaeological material this is not the same as a scientific publication.

Reports submitted by different units are far from standardization (some units/institutions carry on their own standards) therefore it has been decided that when citing particular fieldwork we will refer to the administrative decision it was based on and AZP number of site the research was conducted on (if applicable), therefore citation will be uniform throughout the study. Also, copies of aforementioned decisions are accessible within our institution.

For the purpose of this paper, it has been decided, that the best approach is to present a list of most popular technologies and trace their usage (popularity) in described region and in a set timeframe.

Firstly, such a list of methods would by default be subjective since no legal/official definition of „new" and "modern" technologies in archaeology exists at the moment.

Appendix II to Ordinance of Minister of Culture and Heritage (14.10.2015) on carrying out conservation, restoration works, works, studies conservation, architectural studies and other activities at the monument entered in the register of monuments and archeological research (Dz. U. 2015 poz. 1789.) is describing what archaeological documentation is constituted of.

Unfortunately, this document, which currently is also a legal base for administrative work regarding archaeology, does not mention any of "modern methods" listed in this article or any modern methods at all. This situation leads to one major implication – all of the attempts at using methods listed in this article are until now by default more than legally enforced standard and somewhat voluntarily conducted by an archaeologist or were specifically called for by MWKZ in earlier stages of the administrative process.

Authors of this article decided that a most comprehensive list would be built by tracing subjects and methods discussed during most recent Computer Applications and Quantitive Methods in Archaeology Conferences (see Campana, Scopigno, Carpentiero & Cirillo 2016). This is especially important when one takes into account that CAA has an active Polish Chapter which focusses the attention of those interested in using and promoting different modern methods in Polish archaeology.

As a basic rule, it has been decided to take into account those methods which can be applied to archaeological fieldwork. It has been decided not to take into account work done within museums, on private collections and work conducted via Internet only.

Thus, following methods/research fields have been selected for monitoring:

1. Drone(s)
2. Near Infrared, UV, Hyper Spectral, Multispectral photography
3. LiDAR (ALS)
4. Terrestrial Laser Scanning (TLS)
5. Photogrammetry

6. XRF, pXRF
7. GPR and other geophysical methods
8. Virtual and Extended Reality
9. Databases (other that spreadsheets)
10. Reflectance Transformation Imaging (RTI) and Polynomial Texture Mapping (PTM)
11. Orthophotography
12. Paperless Archaeology Approach
13. Geographical Information Systems (GIS)
14. Experimental Archaeology and Reenactment as part of archaeological research
15. Computer tomography (CT) and X-Rey (Roentgen) Imaging
16. Metal detectors
17. Physico-Chemical sampling and Analysis (inc. C14)
18. Environmental Sampling
19. Online data repositories and data sharing
20. Computer Aided Drawing (CAD) and other vector based scalable drawing documentation

In 2009 – 2014 period ca. 1500 administrative decisions regarding archaeological research were issued; no less than 1243 out of those were valid research permits for archaeological research. In 445 cases neither initial report nor documentation was presented to MWKZ. Main reasons for this state of affairs are in descending order:

1. Archaeological research has not had started within deadlines stated in the permit and the permit lost legal power. Another administrative decision would usually be issued in such case but only on request.
2. The archaeological research did not take place because of investors decision to resign from planned investment or postpone it beyond te 2009-2014 timeframe.
3. Research did take place but archaeologist and investor failed to comply with their legal obligation to provide report and documentation to WUOZ after research.
4. Investment did take place but investor despite holding valid research permit did not inform the archaeologist in time[1].

Failure to provide the field report or documentation is a subject of further administrative actions not related to the main subject of this paper. Of 1243 research permits 1% were issued by MWKZ for given area for academic research. The rest is constituted of watching briefs and excavations related to changes in land use (real

1 Possible in case of watching briefs. It is important to note that in Poland it is investor who is chosing the archaeologist conducting the research before investment. It is also the investor who is issued with the permit for the research, when permit is requested and legal criteria have are met.

estates, roads and other types of construction work). All academic research with valid permits was carried out fully or partially and field reports have been provided (but not all the documentation) for these projects to WUOZ.

Drones – unmanned/remotely controlled or programmable aircrafts have recently found their place in archaeological prospection and documentation of archaeological excavations (see in Prentis 2016; Musson, Palmer & Campana 2013).

Traditional aerial photography is still a go-to method in Polish archaeology in this regard. Also, legal solutions regulating the use of drones in Poland appeared just recently (September 2016). In study area in 2009 – 2014 we can confirm 2 cases of the usage of drones (Decision No 278/2012 from 29.03.2012, AZP 61-66/23 and No 280/2012 from 30.03.2012 AZP 59-61/131;)

Drones, when used in archaeology in Masovia are used on very small altitudes – up to ca. 50m. Usage of drones is an area that, the authors of this paper believe, will grow and become more important in near future. It is an educated guess based on archaeological work being conducted in 2015 and 2016.

Near Infrared, UV, Hyper Spectral, Multispectral photography are popular and very effective tools in archaeological prospection and also play a very important part in the documentation of some of archaeological artifacts and monuments (see in Limp 1989; Wiseman & El-Baz 2007). There is no evidence for use of either of these methods during fieldwork in the study area in 2009 – 2014 period. It is possible that archaeologists potentially conducting research using one of these methods simply failed to mention it in report or report has not been submitted, but it is highly unlikely.

LiDAR (Light Detection and Ranging) also known as (ALS) Airborne Laser Scanning is a recently developed tool used in archaeological prospection across the globe, with great success since early 2000's (Crutchley & Crow 2009; Kamermans, Gojda & Posluschny 2014; Cowley & Opitz 2012; Gojda & Kol 2013). There is no evidence for use of LiDAR during fieldwork in the studied area in 2009 – 2014 period, with one exception.

At the end of 2014, a project conducted by Institute of Archaeology and Ethnology of Polish Academy of Science (Project "Archeologiczne Przywracanie Pamięci o Wielkiej Wojnie"), related to surveying and research of WWI remains has been started. Within the project, LiDAR analysis as a research method is used extensively. The project is still in progress.

MWKZ is actively promoting the method. Some research has been done in 2016 or it is scheduled to be conducted in 2017 due to WUOZ guidelines regarding the planning of new road projects (A2, S79, S8)[2].

2 Aditional information, training and guidelines on LiDAR, aerial photography, geophisics and multispectral imaging is available via http://www.arcland.eu

Terrestrial Laser Scanning (TLS) is a method widely used in documentation of historical architecture and standing archaeological monuments, it is often used during excavations when complex architectural remains are uncovered (Barber & Mills 2011). There is no evidence for use of this method during fieldwork in the studied area in 2009 – 2014 period. It is unexpected since the method is known and widely used in the urban excavation for example in the city of Warsaw, Poznań or Gdańsk.

Photogrammetry is a science of achieving metric information from photographs. Photogrammetry was used in archaeology and heritage management since XIX century, yet at the beginning of XXI century, it is reliving it's renaissance, courtesy of digital cameras and advances in computer software and hardware.

Photogrammetry in its SfM version (Structure from Motion) is currently possibly the most popular method of 3D documentation in archaeology (Remondino & Campana 2014).

This particular method of research is confirmed in case of excavations in Nowe Grocholice (permits No. 601/2013 from 31.5.2013, 663/2013 from 14.6.2013 and no. 1102/2013 from. 27.09.2013, AZP 59-65/12) where evaluation trenches have been set in October 2012 and full-scale excavations conducted on the whole site in spring and summer 2013 before the construction of S-8 road. Photogrammetry has been used to document parts of excavation area as well as single cremation burial in-situ. It is important to note that initial results were obtained with use of a web-based app - 123D Catch - rather than a specific program. Some work has been also conducted on site AZP 53-66/14 Nieporęt (permit no. 288/2011 from 30.03.2011) during the aforementioned survey.

Employees of MWKZ frequently use photogrammetry since 2013 and amount of documentation created with this method within WUOZ surpasses by far all the combined efforts of private archaeologist within the study area (Wiśniewski 2015).

XRF, pXRF are methods of chemical composition measurement and as research methods in archaeology are well documented. XFR is based on the emission of characteristic fluorescent x-rays from a material that has been excited by bombarding with high-energy x-rays or gamma rays. Used for elemental analysis and chemical analysis (see: Sugar & Mass 2012). Polish Archaeologists are not shy from using them in their research (Riegert, Konopka & Kobylińska 2012; del Hoyo-Meléndez, Świt, Matosz, Woźniak, Klisińska-Kopacz & Bratasz 2015) but majority of analyses is either conducted within museums or by Polish specialists on archaeological missions abroad. There is no record of such analysis conducted in field research in Central Masovia. It is possible tough, that some of the material excavated will be subjected to analysis in the future since this method does create an opportunity for this.

Ground Penetrating Radar (GPR), as well as other methods of geophysical prospection, are considered standard tools in archaeological prospection of known

sites. Also sometimes these methods are used in order to find previously unknown archaeological sites in areas of archaeological interest. These research methods have substantial literature (compare: David, Linford, Linford, Martin & Payne 2008; Conyers 2012; 2013; 2016; Misiewicz 2006). Different methods of geophysical prospection known and have been used in time period of 2009 – 2014 no less than 3 times. Results come from Cieciszew, (site AZP 60-68/7, permit no. 982/2013 from 29.08.2013) and Arciechów (site AZP 51-67/35) where both electro-resistivity and geomagnetic method have been used. But in both these cases, the survey has been ordered (and paid for) by MWKZ. Also on site AZP 53-66/14 Nieporęt (permit no. 288/2011 from 30.03.2011) during aforementioned survey GPR reconnaissance has been conducted. Other projects utilizing such methods were conducted outside our research area of nine counties. The year 2016 has already generated no less than 3 such projects but data is not yet ready for analysis.

Virtual and Extended Reality are usually seen as methods of disseminating knowledge and presenting fieldwork results (see Barceló, Forte & Sanders 2000; Eve 2012). Their worldwide popularity and hidden potential have caused their inclusion into this study. Unfortunately, neither has been used in fieldwork in the study area in 2009 – 2014 period.

Databases (other than spreadsheets) also have not been used in fieldwork in the study area in 2009 – 2014 period. Quantities data is gathered and recorded in analog form or in excel spreadsheets (if digitally). This is particularly surprising since there is a wide selection of database tools and solutions and benefits of using databases especially during large projects are innumerable (compare Karamalis 2008: 7).

Reflectance Transformation Imaging (RTI) and Polynomial Texture Mapping (PTM) has not been used in fieldwork in the study area in 2009 – 2014 period. From authors personal sources it is known that at least one of the archaeologists working within the studied area is also conducting such documentation, but only while working in Egypt, not in Masovia, Poland.

Both methods are very similar in their premise allowing to view objects under "varying" lighting conditions to reveal surface phenomena and are to some extent similar in execution to photogrammetry (see Earl, Martinez & Malzbender 2010; Duffy 2013). Both of these methods show in authors' opinion great promise in Masovian archaeology and could be easily implemented[3] only if the archaeological community decides to make the first step.

Orthophotography is largely connected to photogrammetry and requires similar to it work regime (see Verhoeven, Sevara, Karel, Ressl, Doneus & Briese 2013).

3 Aditional information, training and guidelines on RTI is available trough http://culturalheritageimaging.org website.

Therefore it often accompanies photogrammetry as a documentation method used on the same project. Five cases of the use of ortho-imaging during the archaeological investigation have been confirmed. Aforementioned projects in Nieporęt and Nowe Grocholice have brought ortho-photographic documentation but also in Jesówka, AZP 61-66/46 (permit no. 477/2011 from 29.04.2011) during 2011 excavations or in Raszyn (permit no. 944/2012 from 12.09.2012) during archaeological-architectural research and conservation work in XVIII century "Austria" this method has been successfully implemented.

It is already known that archaeological research connected with S-8 road scheme (2015 and 2016) did increase the amount of such documentation. Method dimed to be popular among Polish archaeologist has been registered in less than 1% of conducted research.

Paperless Archaeology - Approach and Paperless archaeological documentation as an idea[4] is absent in study area in 2009 – 2014 period. Some may argue that the very definition is against current legal regulations (aforementioned Ordinance of Minister of Culture and Heritage of 14 October 2015 on carrying out conservation, restoration works, works, studies conservation, architectural studies and other activities at the monument entered in the register of monuments and archeological research specifically lists that drawings and context sheets are to be made among other forms of the documentation). Nevertheless no attempt has been made to even propose such approach to MWKZ in a research application.

Geographical Information Systems (GIS) - possibly the most important "modern" method of archaeological research, analysis and documentation are almost absent in study area in 2009 – 2014 period (5 cases). Aforementioned projects in Nieporęt and Geophysical Surveys in Arciechów and Cieciszew presented data in GIS-ready form, and IAE PAN project (Bolimów) is using GIS but there is, in general, no GIS tradition despite the fact that the method does not require major investments and is applicable to almost any form of archaeological research (compare Conolly & Lake 2006; Streatfeild-James 2016). What is worth noting is GDDKiA[5] system of soil classification, which requires spatial analysis and vector data. This data is being prepared in form of printouts and presented to MWKZ but again it is not used further as a base to build upon and often stands on its own apart of archaeological drawing created manually on paper. Often, if data is presented during any research, vector form it is simplified to .pdf, printed or given as .CDR file; .shp files are a true rarity.

Experimental archaeology and reenactment has not been a part of archaeological fieldwork in the study area in 2009 – 2014 period and although many among

4 https://paperlessarchaeology.com is a valid source of information for anyone interested in the method.

5 The central administration authority for issues related to the national road system.

archaeologist working within the area are actively engaged in reenactment groups and participate in fairs and festivals this aspect of work in all cases is not connected to their fieldwork. Thus there are no open days during excavations and archaeological experimentation is limited in Masovia. Similarly, Computer Tomography (CT) and X-Rey (Roentgen) Imaging has not been a part of archaeological fieldwork in the study area in 2009 – 2014 period[6].

In study area in 2009 – 2014 period metal detectors have been used. No less than 29 preliminary reports confirm that this tool was a part of the research process. Unfortunately, two problems arise. Firstly MWKZ has reasons to believe that this number (29) does not represent all the cases where the metal detector was used and secondly our case study does not reveal anyone developing a true research method involving metal detectors nor have adopted such method developed in other parts of Europe (or world). Use of metal detectors leads to increase in a number of metal finds during excavations but in our case these finds most of the time carry label "topsoil" without additional information or spatial analysis. Metal detectors are by far the most popular method used in this study but we have to reconsider whether in the current form of their use they are still a part of a scientific method. Many archaeologists use it at their own discretion (Archaeological projects conducted legally often use metal detector as a "backup" – a tool for retrieval of those metal artifacts which could be missed during excavation process especially during topsoil stripping) as they would a pencil or a camera but where the use of pencil leaves a trace in form of a drawing and use of camera produces a set of photographs metal detector requires additional policy for recording the results. GPS devices, GIS tools and plotting the artifacts are obvious choices but are rarely used in conjunction with detectors - so rarely that there are no examples within the study area in 2009 – 2014 period.

A metal detector is a controversial tool in polish archaeology. The device is present in polish archaeological research since the 1980s but it is more famous for its use in illegal "treasure hunting" where non-archaeologists (and unfortunately sometimes also archaeologists) conduct random sweeps of parts of landscapes rich with archaeological and historical artifacts. The impact of this method in archaeology is a source of constant concern in Polish archaeology as it is throughout Europe (see Thomas & Stone 2009). For good and for bad (and ugly) metal detectors change archaeology and affect historic landscapes.

Physico-chemical sampling and analysis (inc. C14 but other than XRF, pXRF). There are seven cases where such methods have been used and their use has been confirmed in reports (Nadma permit no. 1236/2014 from 27.10.201, AZP 54-68/57;

6 To the authors knowledge, a substantial amount of work is beeing currently done within the museum collections in Warsaw and surrounding counties (personal communication).

Czersk, permit no. 849/2009 from 3.8.2009; Adamów, permit no. 1197/2007 from 24.08.2007 and permit no. 271/2008 7.3.2008 on AZP 58-62/1; Adamów, permit no. 1284/2008 from 2.10.2008, AZP 58-63/56; Góra Kalwaria permit 563/2014 [8 sites]; Nieporęt, permit no. 258/2012 from 22.03.2012, Sigismund III Waza Manor House/residence; S-8 road Paszków - Opacz, permit no. 1012/2012 from 25.09.2012, several sites). More results are on the way due to work done in 2015 and 2016 but the results have not been made accessible in full yet. Authors main concern is that this number (7) still does not represent full 1% of conducted research despite the fact that physico-chemical sampling and analysis may be viewed as one of the basis of archaeological investigation (see Rink & Thompson 2015; Pollard 2008).

Environmental sampling is a term describing various techniques used to recover, quantify describe and analyze vertebrate remains, macroscopic plant remains, wood and charcoal, pollen and spores, insects, snails and shellfish, parasite eggs and cysts, phytoliths, starch granules, foraminifera, biomolecules, soil micromorphology etc (compare Campbell, Moffett & Straker, et. al. 2011; Canti, Heathcote, Ayala, Corcoran & Sidell 2015). There are twelve cases where such methods have been used and their use has been confirmed in reports (aforementioned Czersk; Michałowice Wieś, permit No 602/2013 from 31.05.2013, AZP 58-65/17; and again the same site on permit no 1101/2013 from 27.09.2013; aforementioned Sigismund III Waza Manor House research in Nieporęt; Pruszków, permit No 909/2014 from 11.08.2013, AZP 58-64/8 [enforced by MWKZ during research]; aforementioned S-8 Paszków – Opacz project; and later five sites from this project researched separately – Puchały permit no 599/2013 from 31.05.2013, AZP 58-65/52; Nowe Grocholice, permit No. 601/2013 from 31.05.2013, No. 663/2013 from 14.6.2013, and 1102/2013 from 27.09.2013, AZP 59-65/12; Wypędy, permit No. 603/2013 from 31.05.2013 and No. 1082/2013 from 23.09.2013, AZP 59-65/11; Stare Babice, permit No. 358/2012 from 20.04.2012, AZP 56-63/11, nr AZP 56-63/27 and nr AZP 56-63/53;

Online data repositories and data sharing as an idea are absent in studied area in 2009 – 2014 period. Although individual archaeologists do share their publications using widely known websites like academia.edu or researchgate.net sharing unpublished data is generally unpopular in academia but in the case of commercial archaeology, it could be taken into consideration especially since many among archaeologist have no intention to publish their results. Online data repositories should be seen so far in Masovian archaeology as an interesting premise but one, which was never (so far) considered by the archaeological community.

Computer Aided Drawing (CAD) and other vector based scalable drawing documentation. Similarly to metal detectors, CAD applications are more a tool than a research method (see Andrews, Bedford & Bryan 2015). Within researched

area and period it is possible to confirm 133 cases of use of CAD like application. One general issue is the medium in which the documentation is submitted – print. MWKZ is rarely handed original .dxf or .dwg files. In most cases, files are printed to .pdf format or physically printed on paper. It is not against current legal regulations but limits the usability of such documentation and prohibits MWKZ from including this kind of documentation into GIS database.

The second issue is connected with specific types of use of CAD in archaeology – quality of work is varying from one individual to another. CAD is often used in a most rudimentary way as a method of digitalizing manual drawings done in the field. In authors opinion, CAD is a method where a great potential is wasted. It is important to note that digital files with .cdr extension accompanied no less than 56 reports from the researched area, from the period of 2009 – 2014. Corel Draw is the most popular non-CAD application for vector graphics in archaeology in the study area. This situation also creates problems. Regardless of the quality of the program itself and quality of drawings .cdr files are proprietary thus use of these files is limited. Secondary the files specifications can change with next versions of the program and thus older documentation is even more difficult to access. Also, in light of this study, it is important to note that when dealing only with paper prints it is very difficult to decide whether drawing has been created in AutoCAD or other CAD application, CorelDRAW or other vector graphic programs. Thus authors apologize for any possible inaccuracy in data cited in the last paragraph.

Conclusions after revising available data – 798 field reports - are not optimistic. While all academic research projects within studied area in the 2009 – 2014 period incorporated one or more of above-mentioned methods one has to remember that purely academic research constitutes ca. 1% of all research done in central Masovia. One can argue that within commercial part of Masovian Archaeology "modern" methods are virtually non-existent since only environmental sampling has been used as a method in more than 1% of projects and most popular metal detectors and CAD applications are more tools than research methods.

The most obvious reason for current situation would appear to be so-called "cutting corners" due to a very small profit margin, low price race and lack of business background among archaeologists - small archaeological units (it has been suggested that polish commercial archaeology is done by ca. 500 individuals employed by ca. 350 private archaeological units other than museums and universities[7]) are unable to invest in training, hardware, software, and data. And it is small archaeological units that dominate the market at the moment. One should also notice the lack of promotion

7 Information from paper "Zawód archeologa w Polsce. Stan obecny i perspektywy" presented by A. Jaszewska and H. Pilcicka-Ciura during session 11 of first Congress of Polish Archaeology. Warsaw 19-21. 09.2013. Unpublished.

of modern technologies in the most universities' programs and foremost lack of legal solutions enforcing and/or promoting new/modern methods in archaeology.

Commercial archaeology is focusing on achieving legally required minimum. This minimum is unfortunately also a current standard. In authors' opinion, it should be our common goal as a professional community to heighten this minimal level by promoting modern methodologies to lawmakers since only legal regulations are enforceable on investors and contractors. One should also notice that it is individuals who generate most work in the area of "modern methods in archaeology"; the majority of archaeologists does not use any "new" method bar digital photography. In this respect, we should remember that new generations of archaeologists - those studying now - live in a digital culture since school. It is authors' hope that for "them" some "modern methods" in archaeology will be a natural choice in the same manner in which digital photography is a natural choice for photographic record.

A good parallel to this is a digital transition in photography. In this regard, world did not wait for archaeologists to decide whether digital photography is an acceptable method of documentation. Within last 15 years, digital photography has steadily become more popular to the point in which it is almost the only option for photographic recording in archaeology (with film and professional photo labs becoming increasingly more difficult to locate). This process took place regardless of the opinion of the archaeological community. Similarly, some of the discussed methods may become widespread and popular outside archaeology due to rapid sociological, economical and technological changes of present time. Drones, photogrammetry, virtual and extended reality, databases, paperless data acquisition, GIS and online data repositories are already a popular part of our everyday lives outside archaeology.

It is the authors' believe that change will come, remains only the question for Polish commercial archaeologists whether they are, as a community, willing to participate in bringing it forth or rather to be "dragged" into it by the rest of the world with the help of their collogues from Academia.

This paper has been presented during TH2-10 session of EAA conference in Vilnius. Session "After 1990: a turning point in the guiding principles of rescue excavations and its impact on scientific research" was aimed "to discuss changes in archaeology before and after 1990" which was unfortunately not feasible for the authors of this study due to the amount of data. For the reasons outlined in the beginning of this paper, authors decided to evaluate 2009 – 2014 period but this work may be continued. In authors opinion, next stage of research is to incorporate data from other periods for the same area. We have so far not committed ourselves to this task, but knowing the subject can outline these proposed timelines to investigate. In authors' opinion one should investigate following periods: Before WWII and WW II; Past WWII until 1962 [first monument protection act established], 1962 until 1975 [territorial reform

in Poland]; 1975 until 1989 [regime change in Poland]; 1989 until 1999 [territorial reform in Poland]; 1999 until 2003 [current monument protection act established]; 2003 until 2009 [early commercial archaeology in Poland] and - Past 2014.

Authors' educated guess is that the amount and quality of projects using "modern" methods have fallen after 1989 and especially in the 1990s but it is also our feeling that we have reached a stable base from which Polish archaeology can only go "upwards". Computer methods, Internet, and a new generation of archaeologists show a great promise for the future. And new projects conducted in 2015 and 2016 are something that authors are looking forward to seeing completed.

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