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## *Text versus visualization in the presentation of diachronic analyses of historical objects on the example of the Saint-Nicolas fort in Marseille*

### *Abstract*

The theme of this paper is the communication of knowledge about the evolution of architectural objects. Our aim is to highlight the impact of the form of transmission and the spatial discrimination used in the analysis on the clarity and the level of understanding of the proposals made. This paper is based on the diachronic analysis of the fort Saint-Nicolas in Marseille presented in the expert report on the condition of the fort, conducted between 2015 and 2022.

In the course of the research reported, a detailed analysis of the fort's evolution was carried out according to two spatial discrimination variants: the fort considered as a whole and the fort divided into its constituent elements arising from its function as a fortification work. In order to highlight potential differences in the interpretation of the content of the report, two researchers independently analysed the information gathered in the report on the evolution of the site. The study based on a diachronic analysis model that allows for visual (diagrammatic) representation of information, taking into account the degree of perceived dating uncertainty, the number and type of transformations and their consequences for the form, structure, function and ownership status of the site.

Even a cursory analysis of the resulting diagrams reveals the specificity and evolutionary independence of the different parts of the fort, as well as significant differences in the interpretation of the same data by different analysts. The article presents an analysis of the results, underlines the most substantial differences between traditional methods of communication and forms using information visualisation, and discusses the potential and limitations inherent in the method of the analysis used.

**Key words:** architecture, representation, fortifications, diachrony, information/knowledge visualisation

### *Introduction*

Acquiring and transmitting knowledge about the development of architectural sites and complexes is a subject matter for many scientific disciplines.

Critical analysis and expansion of knowledge can be done through analysis of historical sources, but also through examination of the remains of objects that have survived to the present day. This process often involves specialists from different fields – e.g., linguists, chemists, botanists<sup>1</sup>. Not surprisingly, the data and information collected is com-

plex and contains various types of uncertainty and incompleteness. This fragmentary data, combined with existing knowledge, forms the basis for considerations aimed at proposing the potential development of a site over time.

Furthermore, the knowledge we wish to convey is diverse in nature. It can refer to transformations (i.e., changes and their causes), the morphology and structure of objects, the materials used, the function, the form of ownership, the state of the object, its historical context, etc. All these elements of knowledge are, or can be, the content of the communication and are heterogeneously charged with uncertainties – both qualitative (e.g., accuracy of position, or completeness, reliability, subjectivity and independence of source) and quantitative.

Communicating this information effectively and transparently to the scientific community, potential stakeholders and, if possible, the general public requires a judicious

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<sup>1</sup> Science is the result of [...] an ongoing collaboration of multiple people over time (Bocheński 1992, 42).



Fig. 1. Scale model representing a hypothesis of the layout of the Saint-Nicolas fort in Marseille, showing the structure after its construction in the 17<sup>th</sup> century. View from the west (source: Musée d'Histoire de Marseille; Valette 2008)

Il. 1. Makieta przedstawiająca hipotetyczny kształt fortu Saint-Nicolas w Marsylii, ukazująca obiekt po wybudowaniu w XVII w. Widok od strony zachodniej (źródło: Musée d'Histoire de Marseille; Valette 2008)

choice of communication form. Various – often heterogeneous – forms of communication are available: text and multiple forms of pictorial representation, which may be static (e.g., hand-drawn sketches) or mobile (e.g., videos, computer animations), using three-dimensional space or not.

Furthermore, a given object can be studied at a specific moment of its existence (e.g., at the end of the 17<sup>th</sup> century, Fig. 1), but we can also consider the path of its evolution, the history of the changes and transformations it has undergone. In the former case we face a *synchronic analysis*, in the latter a *diachronic analysis*<sup>2</sup>.

It is not difficult to understand that an in-depth tracing of the evolution of a given site poses different difficulties for the analysts than suggesting its possible formal layout at a specific point in time<sup>3</sup>. A detailed examination of these differences is beyond the scope of this paper. The focus of this paper will be on the challenges involved in diachronic analysis.

The aim of the research underlying this article was to answer two distinct research questions.

The first question – the answer to which seems quite intuitive in truth, but which nevertheless deserves concrete arguments rather than mere theoretical considerations – says that the understanding of the content of the diachronic analysis contained in a particular study by separate analysts, differs (even in the case of people with similar education and good language skills). However, it should be noted that the nature and degree of these differences escape

us and can be subject to different interpretations. The goal of the experiment is not to interpret differences but to provide means to pinpoint them.

The second question concerns the level of understanding of the diachronic analysis presented in a given study. The postulate adopted here implies that the level of understanding of the information on the object's diachrony provided in a given study does not depend on how the object under study is spatially subdivided by the person analysing the text.

In other words, breaking down the object into separately analysed structures will not modify the analyst's understanding of the evolution of the object.

The work is based on the diachronic analysis of Fort Saint-Nicolas in Marseille (Figs. 2, 3) presented in the expert report on the condition of the fort conducted between 2015 and 2022. This paper will briefly present the diachronic analysis method used in the research, and implemented in an online prototype *Chronographs*. This tool enables the information entered into the database to be translated into a visual language (*diachrogram*, *variogram*) – taking into account the degree of uncertainty perceived in the dating, the number and type of transformations and their consequences on the form, structure, function and ownership status of the site. The visualisations obtained this way will be discussed in the context of the most substantial differences when confronted with traditional methods of information transfer, highlighting their potential as well as their inherent limitations.

### State of research

Communicating knowledge with a whole set of nuances regarding the completeness or reliability of information is a complex problem. When we study the evolution of objects, we are confronted with *states* that change over time. In the case of architecture, these states always involve the spatial form, the function (or lack of it, in the case of abandoned buildings) and the set of materials used in their con-

<sup>2</sup> The concepts of *diachrony* and *synchrony* were introduced into the analysis of language by Ferdinand de Saussure, but their methodological potential quickly took them beyond the boundaries of linguistics and they are now used in the epistemology of many other sciences (cf. De Saussure 1971).

<sup>3</sup> More about the differences and interrelation of both methodological approaches ("diachrony", "synchrony") and their use in the humanities and social sciences can be found in (Banfi et al. 2022; Widdersheim 2018; Chrisomalis 2006; Fitting 1977).



Fig. 2. The former Fort Saint-Nicolas as seen from Fort Saint-Jean located on the other side of the harbour. The fortification was divided in two by a boulevard and renamed Fort Ganteaume (lower fort) and Fort Entrecasteaux (higher fort) in 1887 (photo by J.Y. Blaise, 2024)

Il. 2. Widok na były fort Saint-Nicolas z fortu Saint-Jean znajdującego się po drugiej stronie portu. Całość założenia została przecięta bulwarem na dwie części i przemianowana w 1887 r. – Fort Ganteaume (fort niższy) i Fort Entrecasteaux (fort wyższy) (fot. J.Y. Blaise, 2024)



Fig. 3. View of the interior of the reduit (Fort Entrecasteaux) with visible layers illustrating the fort's evolution over time. Note for example, the modifications made to the east wing in the 19<sup>th</sup> century (right) (photo by J.Y. Blaise, 2023)

Il. 3. Dziedziniec redity (Fort Entrecasteaux) z widocznymi warstwami ilustrującymi ewolucję fortu w czasie. Warto zwrócić uwagę na zmiany dokonane na wschodnim skrzydle w XIX w. (po prawej) (fot. J.Y. Blaise, 2023)

struction. Not all states and transformations (i.e., causes of change) are documented, and the documentation is usually incomplete, full of uncertainties, discontinuities, not to mention contradictions that can be encountered.

One matter is to get results, it is quite another to communicate the findings to the research community, potential clients and the wider community. In both cases – in the research process and in the presentation of its results – we have the same forms of communication at our disposal: text and the many forms of pictorial representation (schematic/realistic, moving/static, using three-dimensional space or not). Each of these forms is more or less suited to communicating diachrony (conveying information about time) or for describing synchronous states. Combining them is a difficult task, requiring choices and compromises (for example, selecting the content to be communicated).

Natural language is the primary form of communication. In written form, it allows a wide range of content to be conveyed – it is used to transmit information about an evolution (transformations of an object), as well as about individual states. It can be used on its own, but the most common examples are hybrid forms of communication, combining text with forms of pictorial representation to complete information that is difficult to convey through language alone (e.g., stratigraphic plans, cartographic documents, photographs). Hybrid forms of transmission may involve diachrony (Komorowski, Sudacka 2008; Lorans, Marot et al. 2022; Tyshkovskiy 2020) or synchronous states (Łukacz 2006; Czerner 2024; Bevez, Bevez 2023).

Historical discourse is a specific form of language use – based on the scientific method and constructed on the basis of quoted data from source documents, field and

laboratory research. This is to enable verification of both the propositions made and the reasoning that led to them. Various forms of method-based refinement of the historical discourse have been introduced.

Gardin's logicism is an example. This method aims to analyse scientific constructs, focusing on revealing the observations, premises and reasoning they contain. The aim is to explore conflicts of interpretation and better define the paths chosen to resolve or avoid them (Gardin 1997; 2012).

Pictorial forms of knowledge transfer on architectural objects (static and dynamic, 2D and 3D) are generally used to convey information on states, since they allow a more concise and precise description of the space compared to text. In the form of diagrams, or when several images of synchronous states are combined, they can also be used to illustrate the evolution of objects.

The introduction of the time function into pictorial representations requires a decision involving the way time is represented. In a variety of visual formalisms, time can be modelled in four different aspects – scale, scope, arrangement and point of view (cf. Aigner et al. 2011, 64–67):

- scale – a visual formalism may use *ordinal time*, and thus only show the relative order of events (before and after), or *continuous time*, allowing the representation of temporal continuity,
- scope – time-based visual formalisms may employ both point-based and interval-based data models,
- arrangement – depending on the intention to highlight the linear or cyclical nature of the events, different variants of *linear* or *cyclic time* can be adopted,
- point of view – the same data can be presented using *ordered time* (events occurring sequentially one after the other), *branching time* (showing alternative scenarios) or *multiple perspectives* (showing parallel events in time).

Visual representations introducing the time function exist in static and dynamic forms. Analytical models and tools integrating space and time have also been developed to assist in diachronic analysis. In historical sciences, these systems are mainly used for research purposes – for example, to analyse transitions in settlement systems (Tanner et al. 2021; Ouriachi et al. 2021), the evolution of urban space (Rodier, Saligny 2010; Lefebvre, Rodier and Saligny 2008; Blaise, Dudek 2011), the evolution of architectural objects (Blaise et al. 2016; Dudek, Blaise 2008, 2021b), etc.

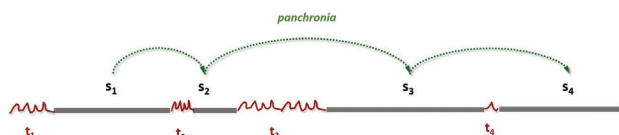


Fig. 4. Synchrony, diachrony and panchrony: an object's evolution seen as consecutive transformations ( $t_1, t_2, t_3, \dots$  – diachronic phases) and states which are their direct consequences

( $s_1, s_2, s_3, \dots$  – synchronous phases) (elaborated by I. Dudek)

Il. 4. Schemat przedstawiający model ewolucji obiektu jako następujące po sobie transformacje ( $t_1, t_2, t_3, \dots$  – fazy diachroniczne) oraz stany będące ich bezpośrednią konsekwencją

( $s_1, s_2, s_3, \dots$  – kolejne fazy synchroniczne) (oprac. I. Dudek)

In this work, we explore the potential of visual tools to highlight the differences in interpretation of independent analysts.

## Methods

A diachronic analysis of Fort Saint Nicolas in Marseille was carried out in September 2024 on the basis of an expert report on the state of the historic fort Saint-Nicolas (2015–2022). The report included a preliminary historical analysis, a description of the state of conservation of the site, proposals for its revitalisation and conservation guidelines (Guérin 2015; 2022). Additional sources and information come from the association “Citadelle de Marseille”, the current lessee of the upper-fort, with the mission of restoring the site and making it accessible to the public.

In some cases, where the information presented was not specific or unambiguous enough, additional primary and secondary sources available on the internet were also consulted: historical cartography (Gallica-BnF, geoportal IGN), historical photographs (Remonter le temps – IGN), historical background studies and archaeological documentation (Atlas archéologique – INRAP).

The research uses a diachronic analysis model, associated with a visual language which allows time-oriented visualisation of the results, that we developed and explained in previous research (Dudek, Blaise 2008). The model is based on a cause-and-effect analysis that identifies the changes made to an object over time (transformations) and the state of the object as a result of these transformations<sup>4</sup>. An important element of the method is the element of *panchrony*, defined sometimes as a “cognitive state” (Leszczak 2003) – such as knowledge, for example – which allows the identity of an object to be confirmed despite the changes it undergoes. The evolution of a given object is described as a succession of transformations and states. Transformation is seen as the diachronic function, subsequent states are seen as synchronic beings which retain the object's identity thanks to knowledge, intuition and experience (Fig. 4).

In the first phase of the study, the task of participants was to identify types and scope of the successive transformations of Fort Saint-Nicolas, to specify modifications introduced to the object regarding its form, function and structure, as well as to provide a concise description of the historical context. The results of these analyses were presented in the form of a diachronic table identifying and describing successive transformations and states, highlighting the type of transformation and the elements that distinguish one state from another.

The key document was the expert report consisting of a series of A3 documents (131 pages in total). If certain pieces of information on historical context were missing, the possibility to use other sources was not forbidden.

<sup>4</sup> The model defines formally 18 transformations and states. The same “label” is sometimes used to describe both a transformation and a state. For example, a “decay” transformation is defined as a process of progressive degradation of an artefact. Whereas a state of “decay” is a situation, that can be triggered by a long-term abandonment of an artefact or by a short-term destruction (a fire, an earthquake, a hurricane, looting...).

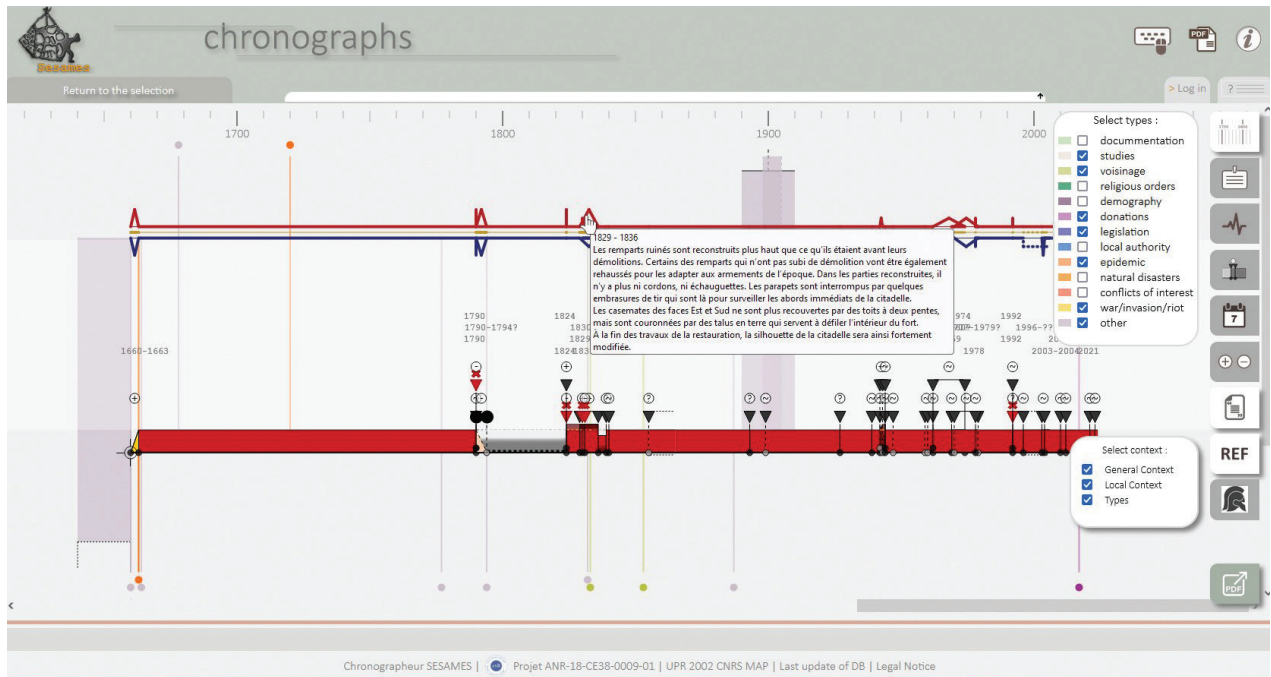


Fig. 5. Chronographs prototype interface. A selection of contextual elements for the high fort (reduit) (elaborated by I. Dudek)

## II. Interfejs prototypowej aplikacji Chronographs – wizualizacja wybranych elementów kontekstu dla wysokiego fortu (redita) (oprac. I. Dudek)

Once organised formally as diachronic table, information along with relevant references was then introduced into the system and visualised using the model's specific graphic language (Dudek, Blaise 2021a).

These diagrams can also be drawn (by hand or via a computer). In the process of description and analysis we used a web application that we called Chronographs<sup>5</sup> (Fig. 5).

The participants taking part in the experiment were two researchers (architects by training) who have been carrying out joint research in the field of diachronic analysis of architectural objects over the years. They are well acquainted with both the French language (understanding), the diachronic analysis model used in the study and the web application Chronographs. Both had an initial but only cursory knowledge of the contents of the expert report. The time devoted to the analysis was not limited (analysis of the expertise, documentation and content feeding). This phase of the study took them 15 and 11 days respectively.

On the basis of the information provided to the system (types of transformations and states, their characteristics and the dating of the transformations with indications of their accuracy), interactive diagrams are generated. They represent a given understanding of the evolutionary process (Fig. 6).

The procedure of the second phase of the study, included the same steps – analysis of the expertise, documentation and content feeding – preceded however by

a subdivision of the fort into components in relation to its function as a fortification work. This involved the completion of five diachronic tables. The second phase of the study was completed by only one researcher (the study took 20 days).

### Exploration of the first research question

In order to answer the first research question, we sought to identify differences in the interpretation of the content of the expert report. To this end, two analysts independently interpreted the information on the object's evolution contained in the report.

A comparison of the diagrams obtained by the two analysts shows interesting differences (Fig. 7). These divergences concern:

- assessment of the uncertainty of dating (variogram, dotted lines indicate uncertain dating),
- perception of the duration of certain transformations (e.g., the introduction of new functions Fig. 7a),
- identification of individual transformations or grouping them together (Fig. 7d, e),
- evaluation of the character of a given transformation – morphological/functional/structural modifications (Fig. 7f),
- evaluation of the state of the object (Fig. 7b),
- evaluation of the importance of a given transformation to the evolution of an object – (*variograms*, amplitude of shape and function lines, thickness of lines for structural changes).

The differences noted also concern the number and type of transformations reported, the trend of the object (growth, decline, stability, etc.) and the importance accorded to the individual transformations (Fig. 8). The emergence of

<sup>5</sup> This application is an online research prototype that we created to support diachronic analysis in the UPR2002 CNRS MAP. For the diachronic analysis of the Saint-Nicolas fort, we used a version the interface of which is still undergoing modifications ([http://anr-sesames.map.cnrs.fr/chronographs/yca/search\\_objectsT.php](http://anr-sesames.map.cnrs.fr/chronographs/yca/search_objectsT.php); accessed: October 5, 2024).

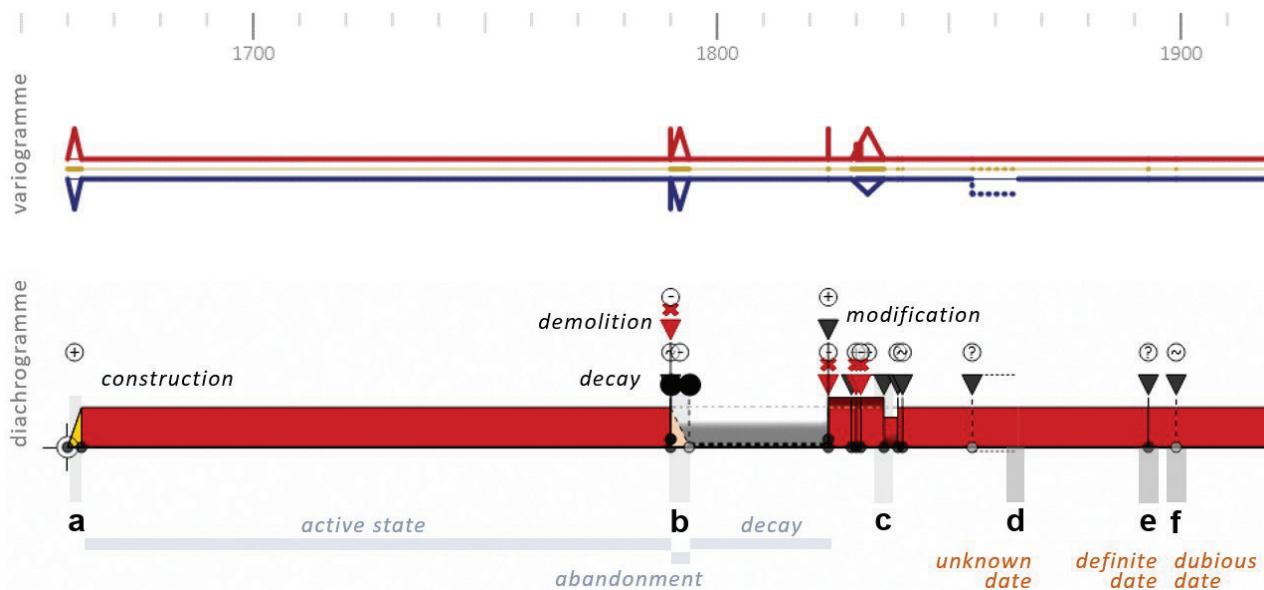


Fig. 6. A fragment of a diagram showing the evolution of the haut fort (reduit) based on the expertise report.

A variogram shows the scope and intensities of change: shape (red line), function (blue line) and structure and materials (yellow line).

The evaluation of the importance of the changes caused by a given transformation can be read from the amplitude (shape and form) or the thickness of the line (structure). Dotted lines indicate uncertain dating.

A diachrogram shows the order, type (a, b, c) and dating accuracy (d, e, f) of the transformations and their impacts (state – colour of the state line; and growth trends – increase or decrease of the state line) (elaborated by I. Dudek)

Il. 6. Fragment diagramu ewolucji wysokiego fortu (redita) powstałego na podstawie ekspertyzy konserwatorskiej.

Wariogram ukazuje odnotowane zmiany: formy (linia czerwona), funkcji (linia niebieska) oraz struktury i materiałów (linia żółta).

Ocenę znaczenia zmian spowodowanych daną transformacją można odczytać na podstawie amplitudy (funkcja i forma)

lub grubości linii (struktura). Linie przerywane wskazują niepewne datowanie.

Diachrogram ukazuje kolejność, typ (a, b, c) i precyzję datacji (d, e, f) transformacji oraz ich skutki (stan – kolor linii stanu; i tendencje wzrostu – podwyższenie lub obniżenie linii stanu) (oprac. I. Dudek)

the above-mentioned differences can be ascribed both to the nature of the documentation under analysis – a narrative using texts<sup>6</sup> and complementary visual documents calling for a considerable interpretation step – and to the impact of each analyst's work habits.

It is also important to note the elements of compatibility between the two analyses which, for someone who is not familiar with the model and its graphical language or who has no experience of reading these diagrams, may remain difficult to discern. Both analysts consider the object as a whole, i.e., without dividing it into its constituent parts (cf. second research question). Both also recognise the sale of the upper-fort to the city (2010) as a separation (secession) of this element from the lower-fort – which remains in the hands of the army. This is a sobering choice, as this interpretation received 0 out of 10 votes in the discussions that preceded the documentary analysis, during the workshops with students. This might be related to the level of knowledge of the fort's history and the decision to focus on the continuity of the site's function and ownership. Despite the differences in interpretation, the overall density of information (i.e., the density and clustering of transforma-

tions) appears similar, as does the legibility of the main periods of the site's redevelopment.

### Exploration of the second research question

In the second phase, another analysis of the fort's evolution was carried out, this time introducing a subdivision of the fort's components in relation to its function as a fortification work – réduit (*réduit*), the first ring of fortifications (*première enceinte*), the second circuit of fortifications (*enceinte extérieure*), the lower fort (*bas fort*), outworks and glacis (les ouvrages et glacis extérieurs). This makes it possible to exploit the *multiple perspectives* formalism in the study of their development (Figs. 9, 10). The analysis was carried out by analyst A.

The assumption made was that the level of understanding of the evolution of an object – on the basis of a document that already possesses a certain granularity of information and a narrative structure – does not depend on how, in the course of analysis, we break it down into separately analysed elements. Behind this premise was, the confidence that once the transformations and subsequent states of the fort Saint-Nicolas had been determined, dissecting this information for the components of the fort would be a simple and almost “automatic” task – which turned out not to be the case.

In practice, it became clear that the new spatial subdivision called for a new, even more in-depth analysis of the

<sup>6</sup> It should be noted that the expert report used as a basis for the analyses has a variable temporal granularity (sometimes the transformations are grouped together, sometimes the individual transformations are listed year by year) and that, despite its chronological presentation, it often contains temporal leaps (digressions) or repetitions inherent in the text.

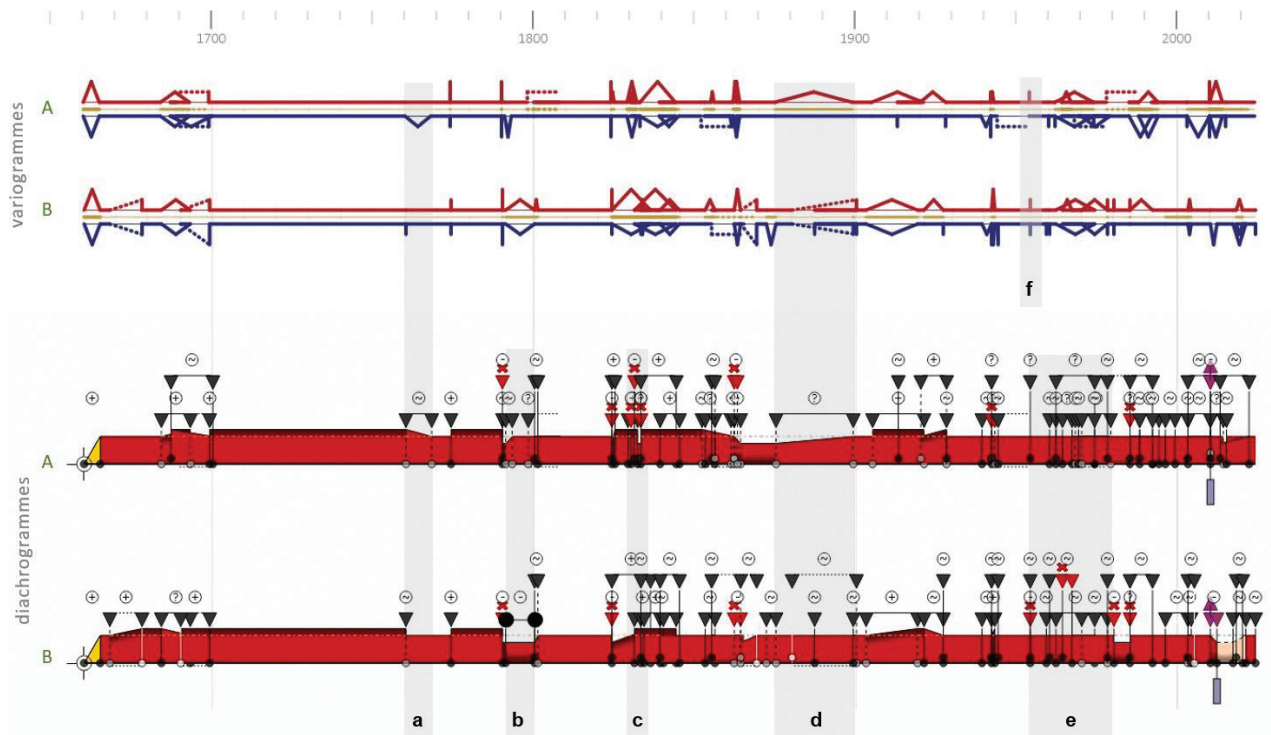


Fig. 7. The evolution of the fort Saint-Nicolas conducted by two researchers (A and B) based on expertise report.

The illustration highlights the most substantial types of divergence:

- a) introduction of a new function (butcher's shop);
  - b) A – perceives destructions of the upper fort as the deterioration of a fragment of the whole site,  
B – highlights the severe deterioration of the citadel during the revolution (decay transformation);
  - c) A – highlights demolitions between 1830 and 1833;
  - d) differences in the discretisation of the transformations 1875–1879 – the period of upgrading of prisons,  
A – groups the transformations, B – lists the individual transformations;
  - e) B – focuses on the demolitions in 1954, 1964–1967 and 1980;
  - f) 1954 – transformation of the old windmill tower into a monument,  
A – considers it as a change in form only, B – presumes a change in function as well (elaborated by I. Dudek)
- II. 7. Zestawienie diagramów analiz ewolucji fortu Saint-Nicolas w Marsylii przeprowadzonych przez dwóch badaczy (A i B) na podstawie ekspertyzy konserwatorskiej. Ilustracja podkreśla najważniejsze typy rozbieżności:
- a) wprowadzenie nowej funkcji (masarnia);
  - b) A – postrzega zniszczenia górnego fortu, jako degradację fragmentu obiektu,  
B – podkreśla poważny stan degradacji cytadeli w trakcie rewolucji (decay);
  - c) A – zwraca uwagę na wyburzenia w latach 1830–1833;
  - d) różnice w dyskretyzacji przekształceń 1875–1879 – okres modernizacji więzień,  
A – grupuje przekształcenia, B – wymienia wprowadzane zmiany;
  - e) B – podkreśla wyburzenia w latach 1954, 1964–1967 i 1980; f) 1954 – przekształcenie wieży starego wiatraka na pomnik,  
A – odnotowuje zmiany formy obiektu, B – zakłada również zmianę funkcji (oprac. I. Dudek)

expert report and the documents it contained. Moreover, in the course of this work, a number of gaps came to light that made it necessary to refine the accuracy of the data – mainly in terms of dating and spatial precision.

The difference in understanding of the spatio-temporal development of the whole object between the two approaches (with and without decomposition into components) proved to be noticeable.

Breaking down the fort into its subparts also improved the readability of the diagrammatic presentation (Fig. 10). Among other things, this has resulted in:

- lower density of information in each diagram,
- better visibility of consecutive states [e.g., revealing the decline of the upper fort (Fig. 10a) less legible in the diagrams for the whole fort (Fig. 7b) or the impact of the construction of the new boulevard, the incorporation of

part of the lower fort into the fort Entrecasteaux (Fig. 10d) is unaccountable in the analysis without subdivision of the fort (Fig. 7)],

- better understanding of relationships between the various components (e.g., the annexation/secession of parcels during the exchange and resale of the land surrounding the fort) (Fig. 10c). The subdivision of the fort into several components reveals the interconnections between them,

- underlining of distinct periods of demolition in the various parts of the fort.

The first phase of analysis was like reading a text with comprehension – at the level of the spatio-temporal granularity of the expertise. The second phase forced us to break down the original text's granularity and thus to break down the original perception patterns. This enabled us to grasp information that had not been spotted in the initial analysis,

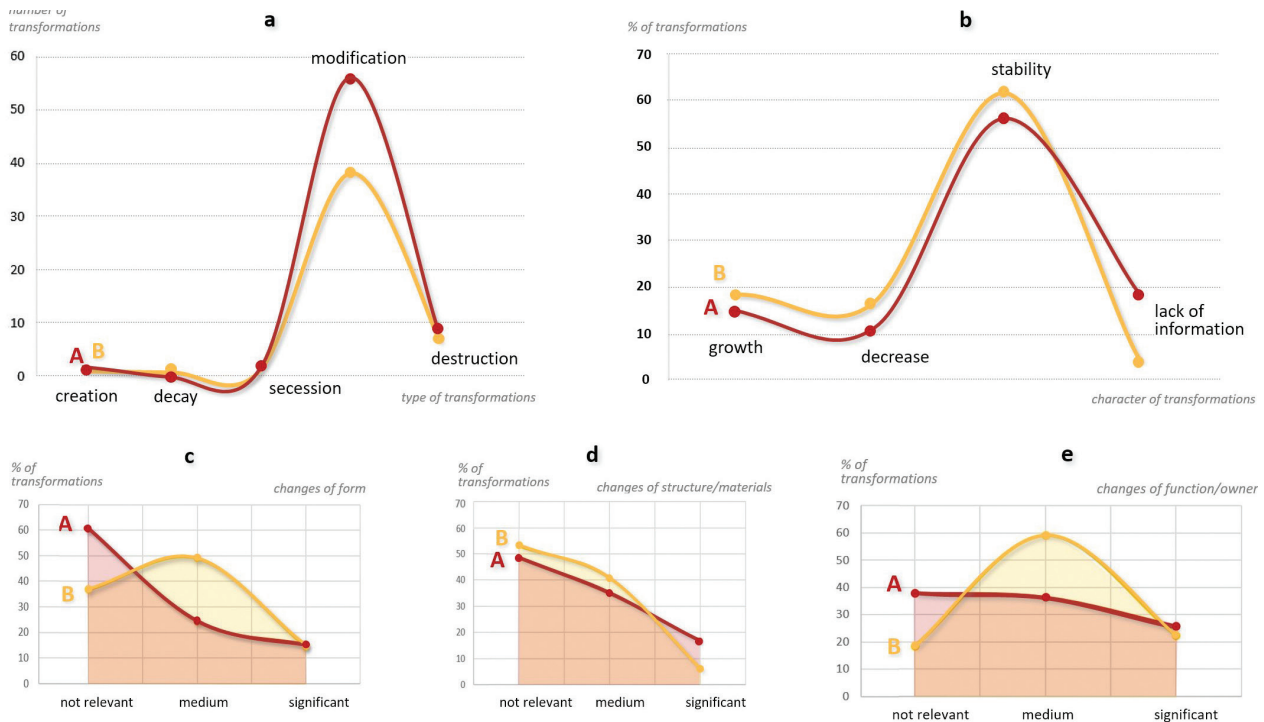


Fig. 8. Summary of quantitative differences between the two analyses:  
 a) difference in the number and types of transformations included in the two analyses,  
 b) difference in the assessment of the complex's growth trend (in terms of percentage),  
 c) differences in the assessment of the importance of morphological changes,  
 d) differences in the assessment of the importance of structural changes,  
 e) differences in the assessment of the importance of functional changes (elaborated by I. Dudek)

#### II. 8. Podsumowanie różnic ilościowych między dwiema analizami:

- a) różnica w liczbie i typie transformacji uwzględnionych w obu analizach,
- b) różnica w ocenie trendu wzrostowego kompleksu (w ujęciu procentowym),
- c) różnice w ocenie wagi zmian morfologicznych dla poszczególnych transformacji,
- d) różnice w ocenie znaczenia zmian strukturalnych dla poszczególnych transformacji,
- e) różnice w ocenie znaczenia zmian funkcjonalnych dla poszczególnych transformacji (oprac. I. Dudek)

contributing to the refinement of our understanding. Visualisation of the results of the interpretation – by introducing non-verbal thinking – allowed identification of unrevealed relationships between components and highlighted patterns in the object's development (Figs. 10, 11). It triggered a substantial improvement of our understanding of the object's evolution.

### Conclusions

“Intellectual understanding” can be language-based (verbal thinking) or image-based (non-verbal) – when we “think” without words. For a number of reasons, at the verbal level there is a greater risk that different people will interpret the content of a given message differently (Korzybski 1951). This suggests that, regardless of the form of communication used, there should not be an assumption of equal understanding of the content and facts presented therein by different researchers.

The preliminary results of our study showed important differences in the interpretation of the same data by the two analysts (preliminary corroboration of the postulate raised in the first research question). These differences were identified using a model that allows a series of consecutive

transformations and states to be described and visualised. This model requires a detailed specification of the interpretative choices made. The associated visual formalism highlights these differences and makes it easier to pinpoint them. This provides a focus for discussions and improves the quality of communication for a better understanding of the evolution of the object. However, attempting to explain the nature of the differences identified is beyond the scope of this paper.

It should be noted that this model forces the selection of a single “evolutionary path” for an object. In cases of serious doubt and alternatives need to be shown, other types of visualisation that use *branching time* should be used. We described such solutions in (Blaise et al. 2016)<sup>7</sup>.

Verification of the second research question showed that the choice of spatial granularity used to analyse the data can radically affect its comprehension, and that the level of our understanding increases with the need to recompose the underlying information (refutation of the postulate adopted in the second research question).

<sup>7</sup> Information on research materials related to the publication (in Polish and English) can be found at: “The online content” (<https://www.map.cnrs.fr/visualCatalogue/index.html>, accessed: October 8, 2024).

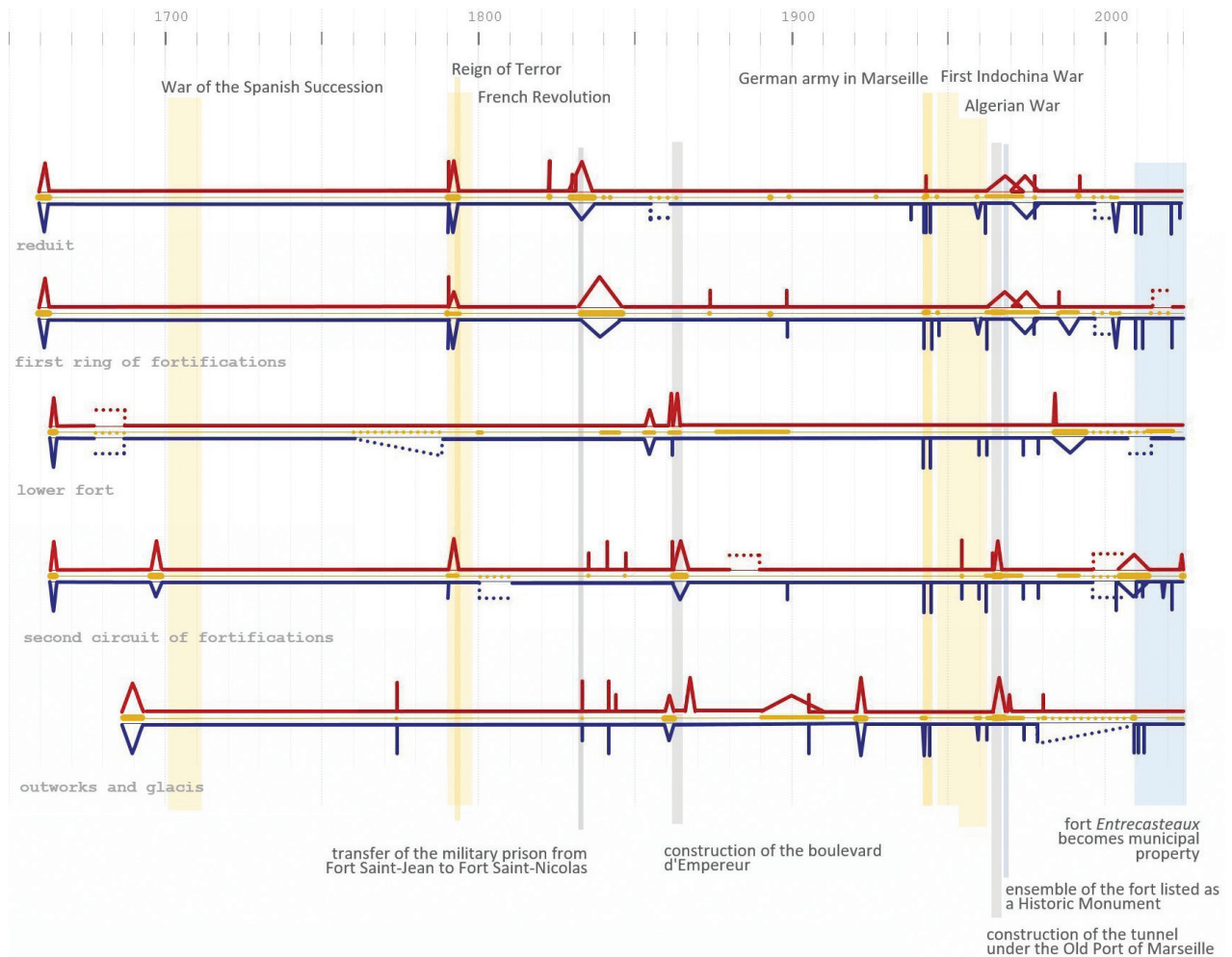


Fig. 9. Compilation of variograms of the subparts of the Fort Saint Nicolas in Marseille.

Use of “multi perspective” time formalism and contextualisation to gain an insight of the main phases in the site’s evolution.

Placing the entire analysis in a broader historical context, helps to read possible causes of successive transformations

(elaborated by I. Dudek)

#### II. 9. Zestawienie wariogramów dla zidentyfikowanych części fortu Saint-Nicolas w Marsylii.

Wykorzystanie czasu „wielopoziomowego” w celu uzyskania lepszego wglądu i podkreślenia głównych faz rozwoju obiektu.

Możliwość umieszczenia całości analizy w szerszym kontekście historycznym

pozwała na lepsze zrozumienie przyczyn i skutków kolejnych przekształceń obiektu (oprac. I. Dudek)

It is clear that the present study is based on a limited number of analyses<sup>8</sup> and at this stage the conclusions presented should not be generalised in any way. The perceived differences in interpretation shall be verified on a larger and more diverse sample of individuals. Similarly, the analysis of the degree of understanding of the evolutionary process of the site should take into account the next levels of spatial division of the site (e.g., down to the level of individual bastions and curtain walls, grouped in relation to the sides of the world – that is, the potential attack sides of the fortification work).

These analyses can be carried out by architecture, archaeology and history students taking part in the summer workshops organised annually at the Citadelle<sup>9</sup> (upper

fort). More in-depth work, which will also aim to complete and cross-reference the existing information, is the subject of our collaboration with the association “Citadelle de Marseille”.

### Summary

Communicating knowledge about the evolution of architectural objects is a complex problem. Its quality and effectiveness are influenced, among other things, by the choice of the forms of transmission, their structure, and the clarity and precision with which the information is formulated. The pragmatic aspect, i.e., the target audience for the message, is another important factor. The number of controversies concerning the differences in findings and viewpoints between specialists in the diachronic studies is widely known. However, it is much rarer for scientific studies to raise questions about the reasons for and nature of these divergences. This is why we decided to use the

<sup>8</sup> A total of three analyses were carried out by two different researchers.

<sup>9</sup> Atelier numérique estival “A l’assaut de la Citadelle” (<https://www.map.cnrs.fr/fr/pedagogie-emploi/formation/>, accessed: October 11, 2024).

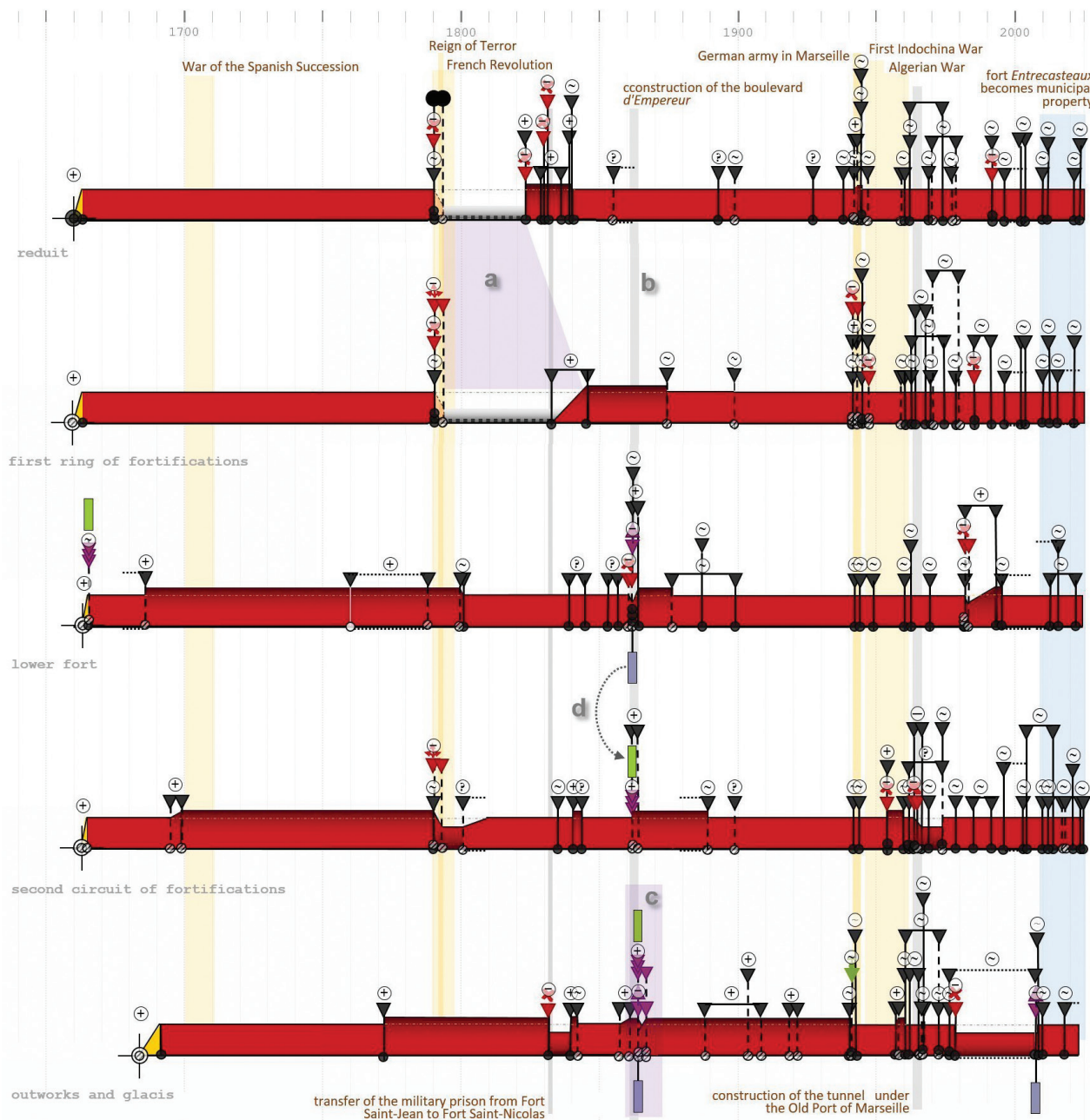


Fig. 10. The result of an analysis of the evolution of Fort Saint-Nicolas, with a formal breakdown of the site into five constituent elements.

The diagram is completed by contextual elements selected to make it easier to perceive previously unnoticed trends:

- a) severe degradation of the upper fort,
- b) the effects of the construction of the boulevard cutting the fort in two,
- c) the exchange and resale of the land and facilities surrounding the fort,
- d) the attachment of a part of the lower fort to the upper-fort

(elaborated by I. Dudek)

Il. 10. Rezultat analizy ewolucji fortu Saint-Nicolas z formalnym podziałem całości obiektu na elementy składowe.

Schemat uzupełniono o wybrane elementy kontekstowe ułatwiające dostrzeżenie wcześniej niezauważonych trendów (diachromy):

- a) degradacja fortu wyższego,
- b) skutki konstrukcji bulwaru przecinającego fort na dwie części,
- c) wymiana i odsprzedaż gruntów i instalacji otaczających fort,
- d) przyłączenie części dolnego fortu do fortu górnego (oprac. I. Dudek)

knowledge acquired in the field of information visualisation and knowledge visualisation to investigate this problem. The case study on which we decided to carry out a series of analyses is a complex object – the fort Saint-Nicolas (Marseille).

Using the documentation made available to us by the curator, a series of analyses of the evolution and current state of the site were carried out. The results of these analyses revealed not only the diversity, but also the specificity of the differences in interpretation of the same data by differ-

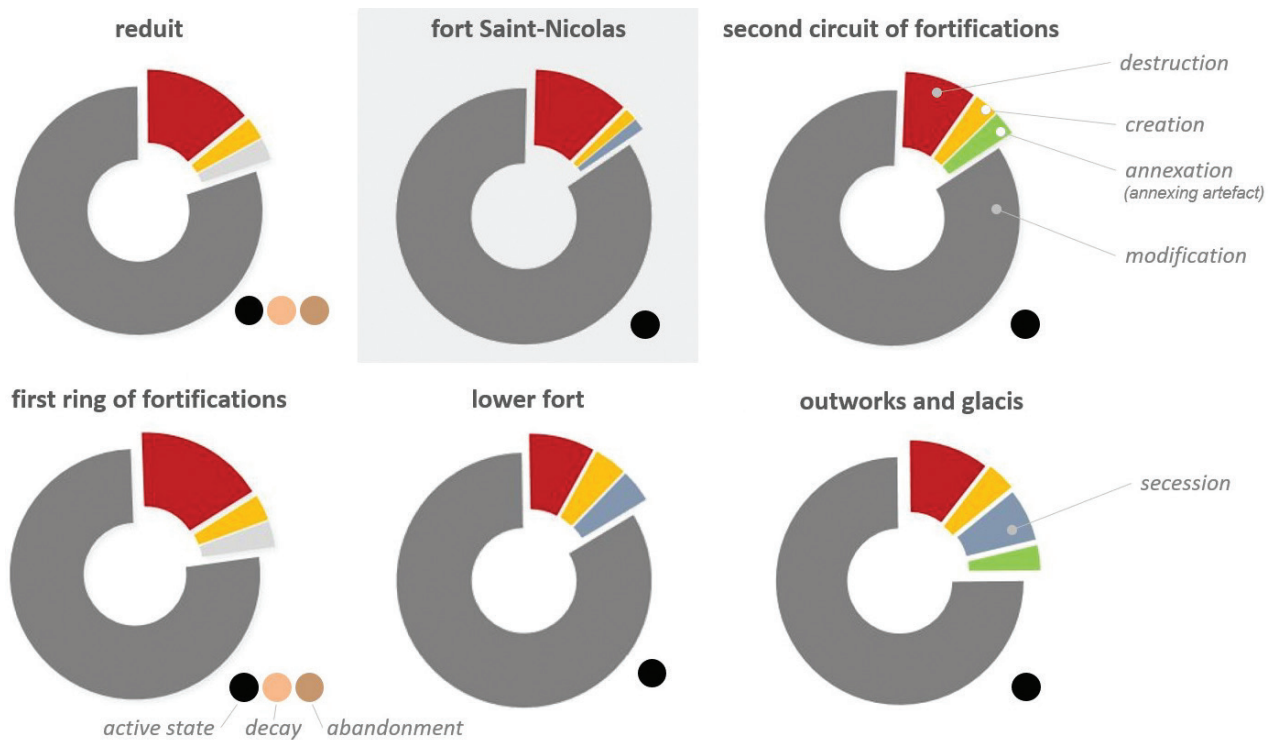


Fig. 11. Summary of the total number of states and transformations identified during the analysis of the fort seen as unique object (Fort Saint-Nicolas) and during the analysis with separation into components. The reduction of complexity of the components analysed resulted in a greater variety of perceived states and transformations. In this presentation of information, a strong similarity can be drawn between the *reduit* and the first ring of fortifications (elaborated by I. Dudek)

Il. 11. Podsumowanie liczby stanów i transformacji zidentyfikowanych w trakcie analizy całościowej (fort Saint-Nicolas) i podczas analizy z rozbiorem na elementy składowe. Zmniejszenie złożoności analizowanych komponentów wpłynęło na większą różnorodność postrzeganych stanów i transformacji. W tym ujęciu danych istnieje silne podobieństwo pomiędzy *reduit* oraz pierwszym pierścieniem fortyfikacji (oprac. I. Dudek)

ent researchers. The second question was to analyse the impact of the spatial granularity of the analyses on the level of understanding of the site's development. Here again, some preliminary but unambiguous conclusions were drawn: the choice of spatial granularity in data analysis can significantly impact the understanding of the evolution of an ob-

ject and the level of understanding is increased by the need to compile the information it contains.

Presenting the results of the interpretation in an appropriate visual form (using non-verbal reasoning methods) facilitates the perception of relationships between the data, information and knowledge elements so depicted.

### Acknowledgements

Many thanks to Isabelle Guérin (heritage architect) for providing the documentation used in this research, to the "Citadelle de Marseille" association for its cooperation and for making the site available for the summer work

shops, and to Isabelle Fasse and Jean-Yves Blaise for organising the workshops. To the latter, we would like to express our gratitude for the time he devoted to the analysis of the entire fort according to the established criteria.

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## Streszczenie

### *Tekst versus wizualizacja w prezentacji diachronicznych analiz obiektów historycznych na przykładzie fortu Saint-Nicolas w Marsylii*

Tematem artykułu jest komunikowanie wiedzy o ewolucji obiektów architektonicznych. Celem autorki jest podkreślenie wpływu formy przekazu oraz dyskryminacji przestrzennej zastosowanej w analizie na jasność i poziom zrozumienia przedstawionych propozycji. Praca opiera się na analizie diachronicznej fortu Saint-Nicolas w Marsylii przedstawionej w ekspertyzie stanu zabytkowego fortu dokonanej w latach 2015–2022.

W trakcie opisanych studiów przeprowadzono szczegółową analizę ewolucji fortu według dwóch wariantów dyskryminacji przestrzennej: fort rozpatrywany jako całość oraz fort podzielony na elementy składowe wynikające z jego funkcji jako dzieła fortyfikacyjnego. Aby uwypuklić potencjalne różnice w interpretacji treści raportu, dwóch badaczy niezależnie przeanalizowało zgromadzone tam informacje na temat ewolucji obiektu. W ramach badania wykorzystano model analizy diachronicznej pozwalający na wizualne (diagramatyczne) przekazanie informacji, uwzględniając stopień postrzeganej niepewności datowania, liczbę i rodzaj przekształceń oraz ich konsekwencje dla formy, struktury, funkcji i statusu własnościowego obiektu.

Nawet pobieżna analiza uzyskanych diagramów pokazuje specyfikę i ewolucyjną niezależność poszczególnych części fortu oraz znaczące różnice w interpretacji tych samych danych przez poszczególnych analityków. W artykule przedstawiono analizę wyników, podkreślono najważniejsze różnice między tradycyjnymi metodami komunikacji a formami wykorzystującymi wizualizację informacji oraz omówiono potencjał i ograniczenia związane z zastosowaną metodą analizy.

**Słowa kluczowe:** diachronia, architektura, fortyfikacje, reprezentacja, wizualizacja informacji i wiedzy