

# 3D-ISF: An impact measurement tool for business and strategic planning in ICT and 3D heritage applications

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## Abstract

*Despite the multitude of impact measurement techniques available to heritage site managers there is a case for the bigger strategic picture to figure more strongly in impact measurement decision making for ICT and 3D applications in the heritage sector. Discussions with heritage managers raised the need for a holistic practical social impact model, one which combines impact measurement with overall strategic decision making considerations, accommodating internal and external dimensions of impact, as well as mission (and vision) and stakeholder perspectives ; and one that embeds impact as a dynamic issue for management in heritage organisations. In other words, there is a case for a total systems approach to impact which delivers from conceptualization to detailed implementation; right through to integrated strategic decision making. One that also can easily accommodate, if appropriate, other more specific measurement methods. The 3D ISF approach is broadly divided into two complementary elements. The left side of the framework considers the strategic perspective of the organisation. The right side of the framework encapsulates the impact measurement. The two elements are complementary and combine to form a holistic vision of the interaction between the site strategy, 3D deployment and its relationship to impact.*

Categories and Subject Descriptors (according to ACM CCS): H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems; H.5.2 [Information Interfaces and Presentation]: User Interfaces

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## 1. Introduction

There is a fundamental need to develop a coherent and robust methodology for the assessing and measuring the impact and outcomes of 3D applications at heritage sites and other contexts that would provide the conceptual and practical bases for training and embedding. The 3D-ISF approach fills a gap as a tool for holistic impact thinking that offers tried and tested accessible steps, with robust measures.

The range of possible heritage sites that may wish to deploy or exploit 3D technology is incredibly diverse and the scale of their operations varies enormously. One of the consistent messages from such organisations is the need for data regarding the impact and outcomes of 3D deployments in order to furnish both individual sites and the sector with information that can be used for strategic decision making. Even very basic data such as financial returns and revenues are not available. Furthermore, establishing the causality

of the link between the 3D asset and the long-term impact is particularly problematic.

Impact measurement is a means of demonstrating the benefit of the application of 3D technology through evidence of outcomes/impacts. If integrated with the strategic decision making of the organisation this information can then be used to deliver an improved service or product; or offer better value (in the wider social sense) to their target beneficiaries.

The 3D-ISF (3D Impact and Strategy Framework) approach was specifically designed to develop capabilities to systematically measure impacts of 3D technology in heritage organisations and also be used at a deeper level to support operations management and strategic decision making.

The 3D-ISF approach helps heritage site managers to conceptualise the impact problem; identify and prioritise impacts for measurement; develop appropriate impact measures; report impacts and to embed the results in management decision making.

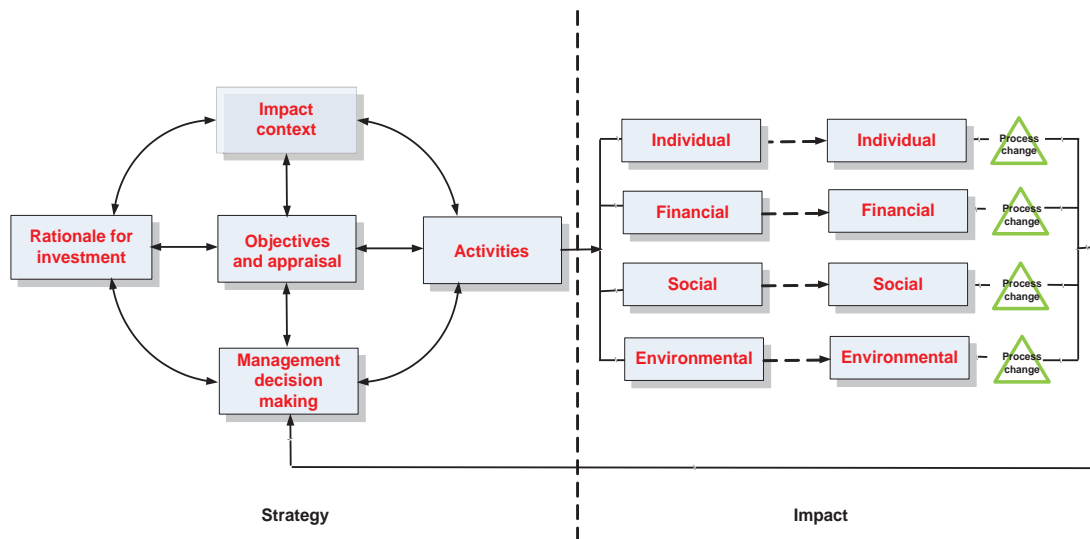


Figure 1: The 3D-ISF approach, summary training version

## 2. Impact and Strategy Framework (3D-ISF)

The 3D-ISF approach (see Figure 1) has its genesis in two related but distinctly different strands of previous research and practice. The ISF approach represents the fusion of two models: the holistic site model developed by the University of Brighton Business School's CUBIST Research Group, for the cultural heritage sector [MSK06] and [MKS07]. And a holistic impact measurement model for social enterprises, developed by the CUBIST Research Group and Social Enterprise London, called SIMPLE (Social Impact for Local Economies). The SIMPLE impact model and methodology has been tried and tested on over 40 social enterprises through a series of three day training courses [MKS09]. Together the models have been tested at over 60 organisations.

Neither of these models could however be directly used to capture the impact of 3D technology at a heritage site. However, both sets of models had been proven with actual organisations and so it was decided to integrate elements of the various models, and add other components to create an impact model that was focused on the application of 3D technology to heritage sites.

A detailed evaluation of the existing impact measurement and valuation tools was undertaken in which it was concluded, that despite the range of "off the shelf" methodologies available that no existing impact tool or measure precisely met the requirements of the heritage sector when it came to assessing the impact of the deployment of 3D technology. Therefore, the challenge is to develop a holistic impact measurement model that would work at the conceptual level but also, and most importantly, at a practical level to build the capabilities of

heritage site managers to introduce their own impact measurement systems that could assess the impact of 3D assets and technology.

The team drew from the results of a needs assessment and the impact tools evaluation survey to develop the 3D-ISF as tool to comprehensively conceptualise the impact problem, and provide an effective practical methodological basis for impact measurement training, help managers to demonstrate the value of their 3D assets to society, to support improved operational performance, business planning, and strategic decision making.

## 3. 3D-ISF: An impact measurement tool for business and strategic planning

Despite the multitude of impact measurement techniques available to heritage site managers there is a case for the bigger strategic picture to figure more strongly in impact measurement decision making.

Discussions with heritage managers raised the need for a holistic practical social impact model, one which combines impact measurement with overall strategic decision making considerations, accommodating internal and external dimensions of impact, as well as mission (and vision) and stakeholder perspectives ; and one that embeds impact as a dynamic issue for management in heritage organisations.

In other words, there is a case for a total systems approach to impact which delivers from conceptualization to detailed implementation; right through to integrated strategic decision making. One that also can easily accommodate, if appropriate, other more specific measurement methods (e.g. Return on investment, contingent valuation or choice

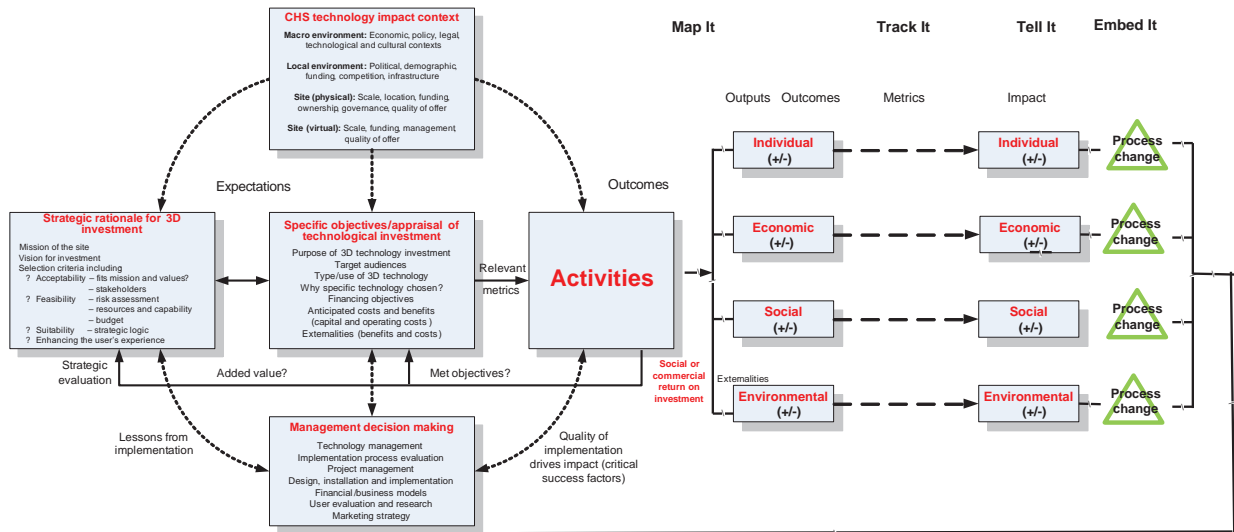


Figure 2: The 3D-ISF holistic impact model –“deeper” strategic version

experiments). While, at the same time, such a model should be practical, flexible and robust which gives heritage site managers ownership over their impact measures and develops the capabilities to implement a professional measurement and reporting system.

The approach is broadly divided into two complementary elements. The left side of the framework considers the strategic perspective of the organisation, while the right side encapsulates the impact measurement. The two elements are complementary and combine to form a holistic vision of the interaction between the site strategy, 3D deployment and its relationship to impact.

Figure 2 presents the deeper version of the ISF model and, most importantly, the backward feedback loop highlights the linkages between impact measurement and ongoing organisational planning and strategic management processes to achieve continuous improvement and maximize desired social impacts and minimize negative impacts.

#### 4. Strategic rationale for technology investment

There has to be a strategic rationale for technology investment. This is usually closely linked to the mission and vision for the site. Strategy needs to underpin the management decision making at a heritage site. Two principal components are suitability and feasibility:

##### Vision

Vision for investment: All investment decisions usually involve some intended innovation to enhance the cultural product offer. The vision is eventually a strategic view of where the site should be and what it should offer. Once this is clearly defined the exploration of the appropriate ICT for the vision can take place.

##### Suitability

- Strategic logic: there must be a strategic logic for the deployment of ICT. At its simplest a heritage site’s strategy revolves around three questions: where is the site positioned now, where does it want to be positioned and how will it achieve that goal. An 3D-based solution may, or may not, be the most effective use of resources for achieving that goal. While 3D technology is a powerful medium for communicating heritage to the public and has numerous research implications, it may not be the appropriate solution for all heritage sites and organisations at a particular moment in time. Therefore, prior to deployment organisations need to make a strategic decision as to the viability of 3D technology in their particular context. Questions that need to be considered include:
  - Does it fit with the objectives and mission of the site?
  - Is financial sustainability required and if so what is the potential ROI?(techniques that could be applied include: Return on investment predictions, payback method)
  - Is there user demand for 3D technology at the site in question?(techniques that could be applied include: questionnaires, choice experiments)
- Site mission: another key question is does the particular use of 3D fit with the mission and values of the site? The mission can be thought of as a heritage site’s overriding purpose and normally is an explicit expression of the values of the organisation. Mission of an organisation outlines the broad general directions that an organisation should and will follow. Questions that need to be asked include: What is the site there for? Whom is it serving? Whom should it serve? Why is it being funded? Some organisations have a

mission that is explicitly tied in with 3D content such as the 3D Museum (<http://www.3dmuseum.org>). However, most museums have a mission that is more general such as education, which partly reflects the impact context (the culture, the national system, and corporate governance and legal system) and also the power and interest of the stakeholders. As a process, not least to guide an impact evaluation, it is useful to know who decides the mission and how it is decided.

The objectives of an organisation represent a more specific commitment, often over a specified time period, consistent with the mission (this may be quantified, but this can be inappropriate in some circumstances). Objectives take the generalities of the mission and turn them into more specific commitments: Usually this process will cover what is to be done and its timing. While trade-offs may arise in objective setting, prioritisation of objectives should be based on the fundamental mission and values of the social enterprise.

An organisation's explicit mission/objectives will create a list of intended impacts and, is therefore the central driver of impact measurement selection, strongly influenced by stakeholder analysis. All investments involve opportunity costs. The potential funds that may be devoted to an ICT project can alternative uses. It is therefore essential that stakeholders support the deployment of resources.

#### Feasibility

- *Risk assessment*: The installation of 3D could potentially represent a risk for heritage sites. For many it is an area beyond their traditional sphere of experience so they are reliant upon external sources of consultancy and services. A typical risk factor is cost outweighing the benefits.
- *Budget*: Sites have to consider if they have the budget for 3D installation and maintenance and/or the resources and capability to support such an installation.
- *Resources and capability*: The introduction of 3D requires numerous new skills. Heritage sites need to establish what resources and capabilities they have for such a deployment. Do they have any skills in house or will the entire project (or part of the project) need to be outsourced?

#### 5. Management decision making

The management decision-making element is another key component that influences impact. There are three components within this element; technology management, the financial and business models, and the marketing strategy.

#### Technology strategy

Cultural heritage sites should have a continuous review of technology strategy (e.g. Web strategy) that can support the cultural offer.

#### Technology management

Technology management is a multi-faceted area:

- *Technology project management*: There are numerous considerations to be made when managing a 3D technology project. For example does the project meet the heritage site's vision? Is there a clear objective? As [SOR05] notes "clear objectives and values help curators take ownership of a project, and feel responsible for whether it succeeds or fails." It is necessary to liaise with external partners and with internal players (i.e. using human resource management for managing change). Not all heritage sites have the luxury of having full-time staff devoted to ICT management. Some have to share IT staff between sites or have staff that do IT-related tasks in addition to other jobs. These sites may have to purchase these skills from outside consultants. If the heritage site is for some reason unable or unwilling to maintain their ICT deployment then its impact may change from a positive to a negative. Furthermore, deploying ICT at a heritage site is not the end of the story. Information technology, as with all technology requires maintenance. Many sites do not have the skills to keep ICT projects running if the technology breaks down. This of course then requires external consultancy to fix any problems – but, needs to be factored into the running costs of the original business and sustainability model. The following factors are also integral with technology management:
  - *Management 'buy-in'*: Much work has been conducted in the commercial business sector that shows that the lack of senior management buy-in is one of the biggest reasons for the failure of technology projects. This is extremely important in the cultural heritage sector because there can still be reticence to the use of information technology in what is still a sector with traditional origins. Without management buy-in projects could fail before deployment or could have insufficient resources for successful deployment, leading to negative impressions by visitors.
  - *Leadership*: Closely related to the above is leadership. Leadership for an ICT deployment at a heritage site exists at two levels; the strategic leadership that drives the overall conceptualization, and the IT project leadership that manages the actual day-to-day running of the project. Strong strategic and project leadership can greatly enhance its chances of success.
  - *Design, installation and implementation*: When visitors come face-to-face with front-of-house 3D at heritage sites their first impression is a function of the design, implementation and installation of the technology. The design of ICT applications is a complex area that is usually beyond the experience of heritage site personnel because so many different skill-sets are required (ICT development, graphic design, ergonomics, etc).

- *The quality of the implementation drives the potential impacts:* An exceptional use of technology can be let down by poor design, location, and implementation (both at a physical site and over the internet). Alternatively, lack of funding may result in poor design because shortcuts were made. This is important because considerable evidence points to cultural tourists as being increasingly sophisticated visitors.

**Financial and business models**

- Financial/business models: In the past many heritage sites have been caught out by the lack of coherent, sustainable business models. Capital funds and grants have been devoted to projects but less consideration has been devoted to the sustainability of the project. There is evidence that this is slowly beginning to change – many funding bodies now require evidence of sustainability and business planning before they grant capital funds to projects. For example, in the UK funders such as the Heritage Lottery Fund and English Heritage now require sustainability plans for the projects they fund. There are numerous considerations for financial and business models, such as charging for specific exhibitions, developing exhibitions with the potential to tour and so gain extra revenue, or more imaginative models such as sharing development costs in return for a percentage of the revenue. 3D –COFORM will consider these issues.

**Marketing Strategy And Target Audiences**

- Marketing strategy: ICT deployments do not exist outside of a business system. If visitors are not motivated to go to the physical or virtual heritage site in the first place then the impact of the ICT deployments can be reduced. A significant investment in 3D might form the basis of a marketing campaign. This certainly increased the awareness and therefore had a considerable influence on the scale of the impacts and outcomes.
- User evaluation and research: Heritage sites have a long tradition of conducting research on their visitors to determine user satisfaction. Visitor surveys or interviews are and well understood by heritage sites. There is also considerable external consultancy available to sites. There is therefore a well-established mechanism that heritage sites can use to determine the socio-economic impact of technology at heritage sites. Furthermore, user evaluation can be used to support marketing research.

**6. Specific objectives and appraisal of the technology investment**

Purpose of technology investment: This is fundamental for understanding the impact of 3D deployments. 3D investment reflects cultural product innovation and can provide a basis for a 'new offer'. There can be a wide range of reasons for the deployment of visitor-facing ICT at heritage sites. These can include:

- Enhancing the user's experience

- Increase visitor numbers
- Enhancing educational impact, or
- Some combination of the above.

A key question that sites often want answered is 'has the investment achieved this aim?' The objectives of a project are key to determining what impacts should be assessed.

The essence of appraisal is the anticipation of costs and benefits. The initial capital cost outlay can be estimated as can the potential social returns and benefits. The anticipated costs may be assessed through the use of Return On Investment (ROI), and Net Present Value (NPV) calculations. It is essential to consider both the capital and operating costs for a deployment. These assessments can then be compared to the potential anticipated benefits that the use of ICT may entail. Once a project is running the impact measures can be used to provide data on the actual return.

**Impact categorization**

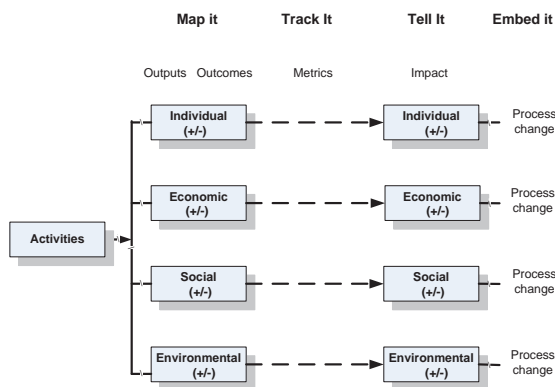


Figure 3: Impact categorisation in the 3D ISF Model

A key innovation introduced in this 3D-ISF model is to re-classify impact categories, moving from the commonly termed triple bottom line to the quadruple bottom line (4BL). The triple bottom line typically includes the financial (including in this case economic) performance plus the social and environmental impacts. The quadruple bottom line shown in Figure 3 emphasises the role of the individual in the appreciation of 3D technology.

**Mapping impact: applying the logic model**

Mapping impacts helps to more precisely and systematically identify the linkages between outputs, outcomes and impacts of heritage sites. This approach utilises an organizational impact mapping methodology derived from the long established Logic Model (e.g. [WEI72, WHO79]).

This method provides a graphical representation of multiple outputs, outcomes and eventual impacts as a

practical basis for developing impact measures. It is a chain of connection which logically states how an organisation's activities are expected to achieve desired results. Mapping (Logic Model) is presented in the logical flow diagram shown in Figure 4:

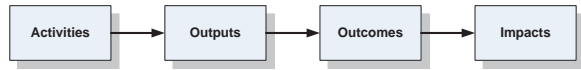


Figure 4: Mapping impacts using the Logic Model

The key four components of the MAP IT process are explained below:

- *Activities*: What are the products, projects or processes that allow the heritage site to fulfil your objectives?
- *Outputs*: What is produced as a direct result of these actions? Generally depict completion of activity
- *Outcomes*: What benefit or change is accomplished, in the short term, as a direct result of the output?
- *Impacts*: What the organisation is able to achieve over the long-term as a result of combined outcomes.

#### Measuring impact using impact indicators

The users draw up a checklist of desired/perceived impact measures which emerge from the conceptual and strategic analysis. Impacts have been divided into groups in order to make their assessment more coherent. This 'bottom line' comprises individual, economic, social, and environmental impacts. Managers need to prioritise the impact categories for measurement. For example, if economic impact is not a priority then there is no need to devote resources to measuring it.

All heritage sites (and all businesses in general) generate impact, positive or otherwise, in each of the four impact areas. A Key Impact Indicator or KII is a quantifiable metric that an organisation can develop to help understand and gauge its performance and impact.

Key Impact Indicators (KIIs) are used to 'value' difficult-to-measure activities such as the engagement with beneficiaries, service level standards, and satisfaction with the product or service.

#### Collect the data (track it)

This step revolves around the collection of the data and how to do it. The methods used should be decided on (such as internal records/questionnaires/surveys, etc). This would also be an appropriate time to review management systems in regard to the collection of data in the future. Systems and procedures need to be established for data collection. Responsibility for collection of data needs to be set, in conjunction with time targets.

#### Comprehend and communicate (Tell it)

Comprehension is achieved through the analysis of the impact data. This is also an appropriate time to review the indicators chosen and assess their usefulness. It is also essential that the lessons learnt from the analysis are communicated in a targeted way to the relevant stakeholders. The results should also be compared with past performance benchmarks.

#### Change (Embed it)

The framework involves the feedback of the analysis of impact data into the strategic, operational and business processes of the site. This crucial components is so often omitted. This is the most important reason for sites to conduct impact analysis – to see if the organisation can be improved.

Consideration should also be given to questions such as is the mission is being met? Are perceived/desired impacts being achieved? Are the stakeholders satisfied? With all this information it should be possible to conduct a strategic/operations review, and propose changes for the future.

Consider new strategies, business processes, systems and organisation. The potential for new investment in areas such as technology should also be evaluated.

#### 7. Conclusions

The 3D-ISF holistic impact measurement model provides a both a conceptual and practical approach to measuring impact. The model offers managers a practical methodology for developing impact measures specific and relevant to their own organization. It guides them through the thought processes of conceptualising impact; identifying and prioritising impacts for measurement; developing specific measures, reporting impacts and embedding the process in management decision making. The model initially formed the basis of the EPOCH holistic site impact model for cultural heritage and the SIMPLE training methodology for social enterprise and which together have been tested on over 60 organisations. This has shown that the underlying principals of the 3D-ISF methodology can be adapted to all organizational sizes and enterprise sectors and is an enabling model in that the specific measures are selected by each organization.

Furthermore, this paper drove impact measurement, through the various steps to tailored indicator design which are most relevant and practical for managers to implement. However, being a holistic, non-prescriptive tool, 3D-ISF can easily accommodate other measurement methods (such as CVM or ROI) depending on an heritage site's priorities, purpose, resources, and capabilities.

The 3D-ISF method could in the future form the basis of an integrated strategic management, impact training and consultancy for the heritage sector, which would require slight adaptations to the model, for example through

addressing feedback loops and adapting other conventional management tools.

## 6. Acknowledgements

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