Information Design: A Project Paradigm for Realizing Business Value from Information Technology

Christopher J. Hemingway

Joe Peppard

Information Systems Research Centre,
Cranfield School of Management,
Cranfield
Bedford MK43 0AL
United Kingdom

Abstract

As information technology advances in terms of processing power, communication, storage and memory, the technical constraints of delivering workable information systems (IS) diminish. Over the past decade, our research has observed increasing levels of technical success with large enterprise-wide applications, such as ERP, CRM and data warehousing. Technological success does not, however, seem strongly correlated with business success, and we continue to observe many organizations failing to realize value from investments they make in IS. Our analysis suggests that this failure stems from approaches to IS development being rooted in practices for overcoming IT constraints rather than enabling information to be used by people. By reviewing successful and unsuccessful IS projects, we have identified the emergence of an alternative paradigm, what we label Information Design (ID). We define this ID project paradigm and highlight the core elements distinguishing ID from the traditional paradigm for running IT projects. How it can be applied in a practical context is described and the differences in outcomes that can result are emphasized.

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INTRODUCTION

Two similarly sized banks operating in the same geographical market deployed the same CRM package. One blames the resultant system for a decline in profitability, the other regards it as the basis for their strongest and most consistent period of profitable growth. A global manufacturer invests over £100 million on a corporate business intelligence (BI) system that is hardly used, whilst at the same time, dozens of local BI initiatives costing £5,000 to £100,000 deliver highly positive returns. Such contrasting outcomes from IT investments are common. Most of the organizations we have studied, and most of those reported in the academic literature and trade press, have had mixed success at realizing business benefits from their investments in information systems.¹ What is clear from the evidence is that the increasing power and sophistication of information technologies has not had the positive impact on the bottom line that many had expected. Although some IS applications, such as enterprise systems, have quite high rates of technical success, many organizations still struggle to generate business benefits from these investments.² Over the last five years, we have studied over twenty successful and unsuccessful large enterprise-wide IS projects, such as data warehousing, analytics, business intelligence, ERP and CRM. By comparing successful and less successful projects, we have found differences that, together, define a new project paradigm for realizing business value through information technology. We refer to this paradigm as Information Design, reflecting its focus on information and its use in decision making processes, not systems or technology.

A TALE OF TWO PROJECTS

Two sites from our research, one assessed as a success while the other deemed a failure, illustrate starkly how the overall paradigm that governs the conduct and execution of a project can affect its outcome. While the paradigm subscribed to by a project team is typically never articulated, contemporary approaches to IS projects and their management are actually governed by a particular worldview. Rooted in practices for overcoming technical constraints, this dominant worldview focuses on data and systems in the abstract rather than enabling information to be used by people. This mitigates against any benefits being generated from a successful technical implementation.

The risks of focusing on data and systems in the abstract were clearly revealed in a longitudinal study of a financial services organizations in the UK, referred to here as FinCo.
For several decades, FinCo had developed its portfolio of financial services products largely through mergers and divestments. This resulted in many silo business units operating under one corporate umbrella but with little integration of central services (e.g. HR or procurement), business processes or IT systems, and some sharp cultural differences between business units. A data warehousing project was established to consolidate customer data across all subsidiaries as well as to integrate with credit-scoring, demographic and other third-party data. With little in-house experience of such large scale data integration, the project team bought in specialist IT contractors, appointed experts from a large IT consultancy and made extensive use of vendor-provided advisors.

Except for a general vision, inspired by success stories such as First American, Harrahs Casino and Capital One, business direction was relatively weak. Senior management consistently said that they wanted data “joined together” so that they could understand more about customer profitability. When pushed for more detail, however, the project team felt that senior management was not forthcoming. As one member explained: “either we’re failing to get them to tell us what lies beneath the surface of their vision or there is nothing behind the surface!” Senior management also expressed frustration at the project team’s continued demands for more detail. By late in the requirements capture phase of the project, some senior managers were beginning to question why so many experts were unable to come up with a workable system design. A consultant on the team argued that this lack of progress was due to receiving mixed messages from the business about what was required, and that the only solution to this was to “get everyone together in a room so we can finally get to the bottom of what the business requirement really is.”

This meeting did go ahead as suggested but its outcome was not what the project team had hoped for. The only clear areas on which all stakeholders could agree were that the system should integrate data from all subsidiary businesses and that, as different business areas already had established tools to analyze their local data marts, it would be preferable to support software tools from many different vendors. When it came to prioritization, however, it proved impossible to achieve consensus amongst the different groups. Business unit strategies placed conflicting demands upon corporate data integration and there was little desire amongst the units’ senior managers to take a more corporate view.

The stakeholder meeting convinced the project team that they were never going to establish clear business requirements, so they held their own project planning meetings to establish what they regarded as a ‘logical’ approach to the problem. First, they looked at the existing customer base and decided that a clear logical division was between personal and
corporate customers. They next classified existing in-house databases as either personal, corporate or both, and obtained metrics on the number of customers covered by each database and the likely effort and cost of establishing a feed from each of them into the new data warehouse. Using this information, the project team developed a prioritised list of data sets to feed into the data warehouse, which would give an almost exhaustive list of FinCo’s personal and corporate customer base with the available project budget. The team’s view was that this would form a useful reference data set for all business areas, showing how each business unit’s customers fit into the overall customer base.

Not having a clear understanding of how the data was likely to be used, the project team copied data from transaction databases in a relatively unmodified form and developed many connections between these data sets to maximize the potential for data matching and data linking. When the data warehouse was shown to users, even financial analysts with experience of writing complex queries for their local data marts found the new data structures confusing. Uptake of the system was negligible, at less than 1% of the expected user base. In an attempt to stimulate take-up, the project team visited a large number of users, asking them why the didn’t use the system. Invariably, the response was of the form “because it can’t do …”, even though many of these comments referred to tasks that the new data warehouse was technically capable of doing. The project team pooled together these comments and derived from them a list of “canned” reports that would address the most commonly expressed needs. Although some of these reports were used, take-up was still very low at under 5% of the user base because, in the words of one stakeholder representative, “they do pretty much what the old data marts do but aren’t as well trusted”. At the time that the empirical study ended, the project board was contemplating whether to invest further to increase utilization of the data warehouse or suspend further investment.

Like FinCo, ChemCo was a very large UK-based organization. Manufacturing chemical products, it had also achieved much of its growth through mergers and acquisitions, resulting in a similar pattern of silo-based information systems. Although having the same motivation of creating a single, complete and consistent picture of their customers, their approach was very different to FinCo. Where FinCo adopted a top-down approach to integrating data, using a traditional, large IS investment project, ChemCo achieved a great deal in terms of improving business use of information before a project was established.

ChemCo’s senior management took the view that creating usable information should intrinsically be part of ‘business as usual’, so large IS investment projects would send out the wrong message. One senior IS manager, for example, was concerned that “We don’t want
people to think that we are going to spend twelve months doing something about MIS reports and then everyone can go back to normal. We need to get across the message that we want managers at all levels to be working in an evidence-based way – and that’s how they should be doing their jobs day in and day out.”

ChemCo’s first initiative was to bring together existing data management and data analysis staff to form business intelligence support teams. Each team was assigned to one or two business units, depending upon business unit size, with the remit of getting to understand business information needs in depth and working with business users to improve their information access and utilization. Initially, support team members began by ‘shadowing’ visits to customers and suppliers to develop an understanding of what information was used in customer-facing work, how it was used or where it was not available, and where it helped or hindered the accomplishment of a task (e.g. negotiating a sale). Each team then held workshops with customer-facing staff to present what they had learned and to discuss their ideas for delivering improved information products.

Based on the workshop outcomes, the data teams developed prototype reports, spreadsheets and OLAP cubes to address identified needs and areas for improvement. These prototypes were given to a small number of business staff to try out and provide feedback. The focus of prototype evaluation was on the ease with which information could be used and understood: “Would this help or confuse the customer?” “Does this layout make it easier to find the information you need?” and “Is there anything you would need to do with this information before you could use it?” were typical questions. After two or three iterations, the support teams were being asked for dates by which a number of the prototypes could be made fully operational. This was the first sign that, partly as a result of introducing the support teams, business demand for better information was starting to grow. Demand was met by delivering working information products through IT applications already on the corporate desktop, such as spreadsheets and management reporting tools, and by modifying existing data marts.

From a technical perspective, this approach was not ideal, with the support teams having to perform additional work to obtain (sometimes manually) data extracts from transaction systems, and at least one team had to use its technical ingenuity to keep the data mart functioning with very limited disk space and memory. Despite the occasional technical failure (mainly because some prototype data extraction processes were convoluted), the new information products were generally well received and adopted by a high proportion of users. Following this initial success, leaders of the support teams were brought together to discuss
how information provision had changed and the technical and information delivery issues that had resulted, particularly coping with increased demand for information and strain on several of the data marts being used. After only two monthly meetings, this business intelligence management forum was proposing changes to the corporate IT infrastructure and data warehouse architecture. Although some proposals incurred costs to increase data storage capacity and replace some ageing servers, the overall package of proposals was almost cost neutral because some ideas for overcoming early technical challenges were translated into organization-wide technical simplification, the processing of data extracts from transaction systems was streamlined and duplication of processing was eliminated, and several cases of multiple subsidiaries buying the same third-party data were identified and replaced with corporate deals. Small to medium sized technical projects were initiated by the IS department to deliver these improvements corporately.

INFORMATION DESIGN AS A PROJECT PARADIGM

It is easy to dismiss projects such as the FinCo case as simply badly managed IS projects. This explanation is not adequate, however, given that project team members, technical experts and consultants were all seasoned professionals with good track records. They were also using widely accepted project management techniques and IS development methodologies, which they had applied to good effect in other projects. It is also easy to dismiss the ChemCo case as nothing more than an example of the innovative local application of IT, not a ‘real’ (i.e. large and expensive) IS project. Again, this is too simplistic a view, given that the initial innovations were stimulated through a corporate decision to create local support teams and, when they were working well, to establish formal governance as a means for creating business-driven information products and evolving IT and information architectures around them. In these and similar cases, we have looked more closely for differences in project management, methodology, skills and behaviors as explanations for success and failure in realizing business benefits from technology investment.

Although the above two case studies provide limited evidence, they illustrate findings we have observed more widely of a distinction between systems-oriented and information-oriented ways in which technology is introduced into the workplace. Whereas the traditional paradigm governing IS projects is oriented towards “the system” and its implementation, we observe successful projects focusing on information and its use in decision-making processes.
Projects run under the traditional paradigm can improve decision-making by providing a more complete, timely and accurate basis for the decisions already made within an organization. Information Design projects, in contrast, aim to change how decisions are made. Where an IS project may provide a better basis for answering the question “What price should we charge for X?”, an information design project begins with the question “Is there a better way of deciding on product prices?” By setting out to answer these second-order questions, an information design project effectively assumes that the ways decision makers (usually quite powerful stakeholders who take pride in their work) currently make decisions can be improved, whilst acknowledging that they have yet to discover a better alternative. In this respect, information design projects challenge head-on the working practices of powerful stakeholders, are more likely to be counter-cultural and, at least initially, will have little clarity about what they are trying to achieve. As such, information design projects rarely begin with specific plans and it is not always easy to tell whether they have achieved anything of note. If a conventional IS project can be likened to travelling to a known destination using a map and compass, an information design project is like an expedition into unchartered territory. The two journeys require different skills, approaches and working assumptions.

Table 1 summarises the distinctions between IS and ID project paradigms that we have discerned from our data.

Our research provides some interesting findings that are consistent with, but expand upon, the idea that information and IT are not always used in rational ways. It suggests that a key part of any ID project is helping decision makers to acquire and use information within the context of their relationships with colleagues and the organizational structures, rules and processes that influence how they make decisions. Current approaches to managing IS projects do not deal with these aspects of organizational context well, lacking a means for analyzing the role that information plays in organizational life.

Decision-making in organizations is mainly concerned with choosing courses of action that will lead to desired outcomes. For this kind of decision-making to be effective, it is necessary to understand which causes (i.e. actions) relate to which effects (i.e. outcomes) and the extent to which the causes can be controlled or influenced by people within the organization. At an operational level, we may want to know the causes of one production line breaking down more often than another. At a strategic level, we may want to understand the cause of a recent decline in sales. The strategic problem may be more vague than the operational problem because it involves many interacting causes-and-effects that are hard to separate, but the basic logic is the same: management interventions are essentially based on
cause-and-effect reasoning. Information and IT only benefit decision makers when they further decision makers’ understanding of the outcomes that will result from the actions they are able to take. If ID projects fail to provide this insight, then they are at best a waste of money and at worst detrimental to business performance.

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<thead>
<tr>
<th>IS project paradigm</th>
<th>ID project paradigm</th>
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<tbody>
<tr>
<td>Objective</td>
<td>Technology implementation</td>
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<td>Focus of improvement</td>
<td>Data flows</td>
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<tr>
<td>Outcome</td>
<td>Rationalised business processes</td>
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<td>Implementation rationale</td>
<td>Process and systems analysis</td>
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<tr>
<td>Design process</td>
<td>Create abstract data model to enable all uses of data</td>
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<tr>
<td>Artefact</td>
<td>Technology</td>
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<tr>
<td>Conception of events</td>
<td>Data changing (i.e. database transactions)</td>
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**TABLE 1** Contrasting project paradigms.

Designing information to reveal cause-and-effect relationships does not feature in methodologies for IS development and is usually not well addressed at the conception, business case or even design stages of systems development. This is mainly due to an imbalance in the skills sets of most IS project teams that are strongly in favour of technology design rather than information design expertise. IS methodologies and tools centre on understanding and changing the process aspects of work through simplification, elimination or automation of their information-based components. The overwhelming response to failures of these approaches to create successful information systems has been to emphasise the need for understanding context, particularly social and political dynamics within the organization. ID adds to this understanding of process and context an understanding of the most fundamental aspect of organizational activity: the information content of people’s work. Rather than modelling a sales process in the abstract, for example, information design establishes what we need to know about the relationships between customers, products and other factors in order to make a sale. Having determined this information content, information design principles can be applied to develop effective means of communicating this information to the salesforce.
KEY FEATURES OF INFORMATION DESIGN

From cross-case analysis of our data, we propose three key features of an information-oriented approach to project implementation to help define this information design (ID) paradigm.

Concrete rather than abstract approach to design

One factor we frequently observe in successful projects is a focus on designing information for specific people, purpose and context. In the ChemCo, for example, time was taken to understand working practices, political behavior (e.g. strategies for negotiating sales discounts) and emotional reactions. Within the conventional IS paradigm, this type of ‘soft’ analysis tends to be undertaken to help manage changes brought about during IS implementation. This is based on the premise that IS success/failure is dependent on handling of the social and political dynamics amongst stakeholders. With ID, behavior and action are the main focus of the design itself. Foremost in the mind of the information designer are questions such as “Why did the customer seem to react badly when the salesperson presented information in this way?” and “What information does a customer take interest in when in a rush, compared with when he/she has more time to discuss a product?” The focus of ID is then upon discovering information representations that are sympathetic to the users’ objectives (e.g. the salesperson and customer).

A key principle of ID is of making relationships of cause-and-effect easier to comprehend: drawing attention to effects of concern to the information user, and showing how things within the user’s control can cause changes to occur. At all times, cause-effect relationships and the level of detail at which they are represented are tailored to the user. When representing the relationship between machine tolerances and the cost of rework, for example, the time horizon and scale of effects would be presented very differently to a shop-floor supervisor and the Chief Operating Officer (COO) because it must recognize the different “levers” they use to cause changes in manufacturing methods. From a traditional technology design perspective, a key strength of the IS project paradigm is supporting abstraction from many real-world problems to a generic data model and functionality. The ID paradigm is concerned with the reverse process: turning abstract data into concrete representations that are useful in addressing specific real-world problems.
Focus on business risk, not delivery risk

A second distinguishing factor of the ID paradigm is its definition and management of risk. IS project management focuses almost exclusively on factors that threaten to prevent successful delivery of the information system. It is usual for an IS project’s risk register to be populated mostly with ‘internal’ risks, such as hardware not being delivered on time. Where external factors are considered, interest centers on dependencies: the external factors that affect the likelihood of project success. Risk management practices for IS projects are also risk averse, focus on minimizing the likelihood of anything occurring that may cause deviation from planned project delivery. The ID perspective does not take a project-centric view of risk but maintains a focus on managing overall business risk. It also, as a consequence, introduces an element of risk-seeking behavior into the information design process. In the ChemCo case, for example, one of the key risks being managed was the ‘risk’ of a sales pitch being unsuccessful. Various ‘experiments’ were carried out with new information designs, in a controlled environment, to assess whether this business risk could be reduced. Initially, the risk of technical non-delivery actually increased as existing data marts were pushed to their limits. Only when the business risk had been mitigated did the technical experts look at managing the technical risks more effectively.

Connectedness and contingency are sought rather than minimized

Project scope is closely associated with project risk. It is not unusual, for example, for a project manager to de-scope a project to minimize the risk of delayed system delivery (again, this is a project-centric view of risk). Precisely defining project scope is regarded as project management good practice, ensuring that the system can be isolated from other aspects of the organization so that delivery effort can be concentrated. Where it is impossible to separate the IS project from other events, dependencies are identified and managed as project risks.

The ID paradigm takes the opposite view, regarding the connections between people and events as the main driver for information use. People use information as an artifact in social interaction (e.g. to convince others of the validity of an argument) and to understand the relationships between themselves and their actions and others and their actions (e.g. which customers will buy more if we advertise in this way?). It is only possible to design information effectively if this interconnectedness is understood because it is the reason why information is sought and used. Rather than seeking to delimit scope and disconnect development from mainstream business activity, the ID paradigm seeks to identify and exploit connections between business activities. Although, as in the case of data warehousing,
connecting fragmented data plays a key role, ID initiatives are particularly concerned with joining-up business activity and plans for business change.

Although an ID project may have an overall strategic direction, its objective is to provide stakeholders (employees, customers, etc) with a more holistic view of their work and a means for taking a more holistic and integrated approach to their work. This process of innovating information design and discovering better ways of working with information is inherently one of trial and error. Essentially a quality-oriented process, information design is more effective as an ongoing business activity than a one-off project. Consequently, the traditional IS project focus on delivering within a specific time period, with strong cost and scope control is counterproductive. As in the case of ChemCo, ID tends to be more successful when embedded within business-as-usual, working to develop new insight and understanding, or challenge current misunderstanding, and, thereby, foster more productive working relationships between staff, customers and suppliers.

**IMPLICATIONS**

The conventional information systems design paradigm is system-centric, rather than business-centric. As such, it de-contextualizes information, creating data that can be processed according to a formal system of rules and procedures. By abstracting from real-world complexity it simplifies system design and ensures there are clearly defined deliverables. All of this is good practice for designing ways of getting information from the human domain into the technology domain, so that we can exploit the phenomenal data processing capacity of computers. The problem for so many organizations is that we continue to apply this design philosophy to the task of getting data out of the technology domain and turning it into information that is usable by human beings in the context of their work and the social interaction this entails. Logic, and our continued observations of IS project failure, tell us that the reverse process ought to be applied. The philosophy of ID is to go from the abstract to the contextualized and concrete, so that information becomes more accessible to people. Many of the organizations we have observed suggest that a failure to achieve this lies at the heart of many technically successful projects failing to deliver sufficient business benefit.

The different approach to risk needed for successful ID implies that conventional project management approaches get in the way. Its emphasis of corporate to the exclusion of user objectives, its need to fix scope in contrast with ever changing business needs, and its fixed term focus rather than concern with ongoing improvement are all problematic for ID. In these respects, project management is the antithesis to good business practice: the project’s
customers too often get what they’re given instead of the information they need. This can be a sensible approach to technology delivery, where users are more concerned with functionality than the method of delivery (e.g. most users are more concerned with the speed of their network connection than the make and model of the network routers). With information, however, the user is very much concerned with the delivery method. The differences between a spreadsheet pivot table and a paper report, for example, can be hugely significant to the user, even where derived from the same underlying data. It may be that many business problems can sensibly be divided into IS and ID components.

The foundations of the IS paradigm and subsequent conceptions of how to deliver IS projects have been shaped by a historical need to overcome technological constraints. This was appropriate when facing the technological challenges of processing a multinational’s payroll with less computing power than today’s mobile phones. For some years, we have been moving away from this period of technological constraint into an era where we have the computing power to process and deliver vast quantities of information but this has sometimes made matters worse in terms of organizational and individual worker performance. The ID paradigm outlined here proposes three core elements of a different approach that focuses on overcoming the human constraints on information use by engaging with information users differently. Much prior work in cognitive psychology, statistical graphics, decision analysis and risk management gives advice that could support the creation of methodologies and design practices to realize the ID paradigm, just as existing IS methodologies and project practices instantiate the IS paradigm today. The theoretical challenge lies in testing and improving the conception of the ID paradigm presented here, and then drawing upon these reference disciplines to make the ID paradigm an effective and robust basis for practice.

We are not advocating that the ID paradigm should replace the currently dominant IS paradigm. Our data suggest that many projects would generate more business benefit if information delivery was separated from systems implementation, and management was then based on the ID or IS paradigm accordingly. The key to success is treating the “supply” and “demand” aspects of information systems separately. The “supply side” (i.e. putting data about the real world into a system) can be subject to conventional IS design principles, whilst the “demand side” (i.e. getting data from the system and making it usable in the real world) is best approached from an ID perspective.
REFERENCES


