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The business of expectations: How promissory organizations shape technology and innovation

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Abstract

The business of technological expectations has yet to be explored thoroughly by scholars interested in the role of expectations and visions in the emergence of technological innovations. However, intermediaries specializing in the production, commodification and selling of future-oriented knowledge have emerged to exert new kinds of influence on the shaping of technology and innovation. We focus on the work of those specialist forms of consultants known as ‘industry analysts’ and consider them as *promissory organizations* to capture how they are successful in mobilizing and indeed increasingly organizing expectations within procurement and innovation markets. Our aim is to highlight the important role these actors play in shaping technologies and, in so doing, to show how they typically exhibit complex and highly *uneven* forms of influence. The paper is organized around a central question: Why are certain kinds of promissory behaviour more influential than others? To answer this, we draw from discussions of the ‘constitutive’ nature of promises in the literature on technology expectations, which provide a useful but arguably partial analytical approach for articulating the dynamics and differences surrounding product based expectations. We thus supplement our understanding with recent developments in Economic Sociology and the Sociology of Finance where an ambitious theoretical framework is unfolding in relation to the ‘performativity of economic theory’. By contrasting different forms of promissory work conducted by industry analysts and varying forms of accountability to which this work is subject, we begin to map out a typology that characterises promissory behaviour according to differences in kind and effect.

Keywords

expectations, Gartner, industry analysts, performativity

By tracing the work of ‘promise builders’ in the emergence of specific artefacts and innovation fields, scholars have demonstrated how technological expectations influence

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the development of new artefacts and knowledge (Brown et al., 2000; Swanson and Ramiller, 1997; van Lente, 1993; van Lente and Rip, 1998). The focus has typically been on ‘innovation players’ whose hopes and efforts are invested in the success of new technologies. However, in recent years, we have seen the growth of independent third-party organizations dedicating themselves to the production, distribution and sale of future-oriented knowledge and tools (Burks, 2006; Firth and Swanson, 2005). Intermediaries such as ‘industry analysts’ draw up signposts about the state of the industry and its future development, and set criteria for assessing new innovations. Such assessments often are critically oriented towards vendors and their offerings, and turn out to fulfil a crucial role in shaping the development of technological fields and constituting markets for constantly changing supplier offerings. Scholars have yet to consider how technological fields may be shaped through interventions by these and similar types of market actors. What influence does the emergence of intermediaries specializing in the *business of technological expectations* have on the development of new technologies?

Our general aim is to throw light on the important function played by specialist consultants for mobilizing promises and expectations in supplier and user communities. We draw on research conducted over several years on the largest industry analyst in the information technology (IT) area: the Gartner Group.¹ We analyse these actors as ‘promissory organizations’ to capture the predictive element of their work (how they *mobilize* promises about new technologies) but also the wider evaluative, often critical, role they play (the *organization* of the promissory space). Promissory organizations are defined as intermediaries, which are prodigious in the production of future-oriented research that not only represents the state of affairs in a particular marketplace but also contributes to shaping such markets. Our specific aim is to understand the extent to which their advice is ‘performative’ – suggesting that technological visions mobilized in the building of technological fields do not simply describe future technologies but also help to bring them into being (Brown et al., 2000; Michael, 2000; van Lente, 1993). Industry analysts appear to be an ideal group to test and develop the emerging performativity thesis in that they exhibit complicated and highly uneven forms of influence. However, whilst current work on the performative nature of technological expectation is suggestive, we argue that it can also be strengthened through the addition of further analytical templates for tracking promissory work with respect to the differing ways it may generate and configure innovation. Thus to fully unpack the work of industry analysts we also draw on recent discussions of the ‘performativity of theory’ emanating from economic sociology (Callon, 1998, 2007) and the sociology of finance (MacKenzie, 2006, 2009), which include the basis of a framework for conceptualizing strong and weak forms of influence, as well as successful and failing forms of knowledge. Inspired also by the argument that the nature, character and effect of promise-based assessments are best understood comparatively (cf. Borup et al., 2006), we begin to derive from our fieldwork a *typology of promissory work* that characterizes differences between various kinds of promissory behaviour.²

The sociology of expectations

Scholars acknowledge how expectations are crucial to the development and shaping of new science and technology. Borup and colleagues (2006: 285–286) argue that

innovation rarely ‘... can work in isolation from a highly dynamic and variegated body of future-oriented understanding about the future’. Promises are seen to be ‘fundamentally generative’ in the production of artefacts and knowledge. Expectations can help innovators mobilize support and funding for emerging artefacts. Van Lente (1993: 187) developed the nostrum ‘by sketching a future, others will find reasons to participate’ to characterize how expectations grab and direct the attention of actors. Stewart (1999) coined the term ‘poles of attraction’ to explore how (IT supplier) firms seek to mark out their plans and visions of future technology with various identifiable purposes. These purposes include mobilizing the expectations of potential customers and thereby building confidence in, and winning commitments to, an emerging technology; and, at times, warding off competitors, mobilizing fear, uncertainty and doubt and thus frustrating a competing technology. Not only do expectations help enrol external actors (or ward off competitors) they are also seen to guide and shape the activities of technology development teams. They do so, as van Lente (1993) argues, by providing structure and legitimation to an inherently uncertain activity. Working within the social study of information technology, Swanson and Ramiller (1997) have highlighted the role of ‘organizing visions’ in information systems innovation, encompassing interpretation, legitimation and mobilization, all of which help to mobilize the material and intellectual resources needed for innovation. Expectations help build consensus both about what to expect and on the nature of the various opportunities and risks that may lie ahead (Borup et al., 2006: 285).

Scholars have focused on the often ‘hyperbolic’ nature of expectations. Gregory, for instance, has developed the concept of ‘incomplete utopian project’ to describe the ‘phenomenon of envisioning as constructed, evoked, and employed within an innovative intra- and inter-organizational effort, and to open up theorizing about innovation, work practices, and technology’ (Gregory, 2000: 180). The word ‘utopian’ draws our attention to the influence of ‘longstanding deeply shared desires simultaneously characterized by their unrealizability and their devotees’ tendencies to over-reach reality in their pursuit’ (Gregory, 2000: 194). It has been suggested – though we are not sure how this can be measured – that expectations are becoming *more* unrealistic and levels of hype are *increasing*. Borup and colleagues (2006: 286) write that ‘hyperbolic expectations of future promise and potential have become more significant or intense in late and advanced industrial modernity. This shift in intensity is probably connected with a number of tendencies in the contemporary character of science and technology’. These tendencies include but are not limited to the fact that ‘processes of science and technology innovation have become more complex, with a significant increase in the amount of communication and interaction across institutions and epistemic borders’ (p. 287).

What is at issue, however, is not just the growing technical and organizational complexity of innovations, drawing upon growing arrays of knowledge and experience that may be dispersed across occupations and organizations, but also the accelerating pace of innovation. Actors thus seek competitive advantage by improving the efficiency of communication between producers of complementary products and with the ‘market’ constituted by intermediaries and final consumers (Howells, 2006; Stewart and Hyysalo, 2008). We see the emergence of active strategies to grapple with and manage complexity and uncertainty to improve the pace and efficiency of learning

rather than simply ‘wait and see’ processes where an innovation succeeds through trial and error. There is as a result greater competition between expectations, meaning that more attention is placed on future knowledge and its coordination. Added to this, or perhaps because of this, new kinds of activities (road mapping, standardization, public policies, envisioning, and so on) and actors (industry watch bodies, consultants, academics and of course industry analysts) are attempting to better regulate and systemize that competition for ideas. Consequently (and perhaps this is what Borup et al. (2006) refer to), expectation-building activity has been significantly augmented and has become increasingly proactive and oriented towards longer-term futures. However, we would argue that what is most interesting about these forms of expectation is not their imputed hyperbolic character but the fact that they are coordinated in a more organized way.

Expectations and their accountability

There is an important body of research suggesting that the articulation of expectations and ‘hype’ about new technologies requires serious analysis, as they constitute an important medium for shaping innovation. The reason expectations are often overly optimistic say Geels and Smit (2000: 882) is ‘... *not* that forecasters or futurists are ignorant or short sighted’, but rather that ‘[i]nitial promises are set high in order to attract attention from (financial) sponsors, to stimulate agenda-setting processes (both technical and political) and to build “protected spaces”’. Brown (2003: 17) provides a note of caution, arguing that ‘[i]n so many cases, the present fails to measure up to the expectations once held of it. This can have disastrous consequences for the reputations not only of individuals but entire innovation fields’ (Brown, 2003: 9). Along similar lines, Borup and colleagues (2006: 289) suggest that unrealizable expectations may damage credibility because by making such promises, actors can potentially be ‘held to future account’. Intuitively we feel this is right, but think scholars could also be more nuanced here. It is unlikely that all expectations are accountable in the same way. Longer-term predictions, for instance, may project too far into the future and be couched in too many techno-scientific uncertainties for any group to be held responsible for their non-materialization. Conversely, there may be other shorter-term assessments that subject such predictions to scrutiny (and possibly sanction). Moreover, if it is true that expectations are subject to different forms of accountability, this begs the question of whether they also exercise different forms of ‘influence’. This takes us to the topic of performativity.

Expectations as performative

The notion that promises are ‘performative’ or even ‘constitutive’ of phenomena is a fruitful line of enquiry (Borup et al., 2006; Michael, 2000; van Lente, 1993), but also one that needs to be strengthened with the addition of new theoretical templates and further empirical work. The clearest example of how the notion of performativity has been applied in this context is the history of the microchip. In the 1960s, GE Moore predicted

that the microchip would continue to increase exponentially in complexity and processing power. 'Moore's Law', as it has become known, was widely judged to have been a successful prediction because it was a 'self-fulfilling prophecy':

This prediction turned out to hold so well that we may speak of a self-fulfilling prophecy. The fulfilling did not occur because it was a prophecy, but because actors have taken up the prophecy, and acted accordingly. They provided the reasons for other actors to accept the expectation and act accordingly, et cetera. (van Lente, 1993: 87)

In other words, because industrialists and technologists were convinced by Moore's claim that decreases in the size of microchips would be persistent, they acted as if it was true and continued to fund research into the further miniaturization of this technology. The prediction was thus brought into being (see also MacKenzie (1996), who offers a similar view on the history of the microchip). Importantly, neither van Lente nor MacKenzie suggest that technologies are a simple or direct product of promissory work.³ This is because we cannot presume stable trajectories and the continuation of existing sets of expectations (Fleck et al., 1990). As Jørgensen and Sørensen (1999) remind us, even where apparently stable sets of beliefs are shared by other relevant actors, one cannot rule out the entry of still other actors and confounding factors into the arena. In such an environment, there is every opportunity for beliefs to be challenged and reworked in the arduous process of creating artefacts and making adequate linkages with the organizational and institutional practices of intended users. Various analytical frameworks within Science and Technology Studies (STS) have argued that the achievement of a new technology takes place in a heterogeneous landscape, involving a diverse and unevenly malleable array of human and non-human elements.

The most problematic aspect of the notion of a self-fulfilling prophecy is that it invites the interpretation that *any* vision, if handled and communicated by enough reliable and trusted actors, could become true. This is presumably the case for the most robust or insubstantial of facts or rumours: it is simply enough that people take-up a statement and that because the belief is widely shared by others then it makes little difference if the statement is informed or arbitrary, since because it is believed by everyone the world comes to resemble it (Callon, 2007; MacKenzie, 2006). This interpretation is still widely held, but arguably found wanting because it does not deal adequately with the 'content' of expectations or the work involved in their 'production'. What is at stake when we ignore the content and production of expectations is that it decries the idea that this type of knowledge has a valid base; it is also indifferent to the fact there are various levels of work involved in its construction. For instance, one of the concepts advanced to capture the presumably unsubstantiated status of these kinds of knowledge claims is Rip's seminal work on 'folk theories'. Folk theories, he writes: '... are a form of expectations, based in some experience, but not necessarily systematically checked. Their robustness derives from their being generally accepted, and thus part of a repertoire current in a group or in our culture more generally' (Rip, 2006: 349). Indeed, Rip describes 'the Gartner hype cycle', a device used to map the rise and fall of hype surrounding emerging technologies, as an example of a folk theory. He notes

that whilst it is highly influential it does not necessarily result from sustained forms of research:

Introduced by the Gartner Group as the hype cycle for information and communication technologies, it has become a folk-theory par excellence, because it is widely recognized, used to draw out implications, and *not an object of systematic research*. The visualization provided by the Gartner Group is widely referred to, and copied on websites. ... It shapes thinking about further developments and possible responses. (Rip, 2006: 352–253, emphasis added)

As we see it, there is a problem with the notion of a folk theory when applied to the work of industry analysts. It places undue emphasis on the acceptance of this knowledge as opposed to its production. This lends weight to the suggestion that these tools could be more or less arbitrary and they become influential primarily because of their diffusion. However, we think scholars need to be more precise here. We need to say something about the various effects expectations might have (be they strong, weak or even ‘temporary’ forms of influence). Not all expectations influence technologies in the same way. Why is this? Current templates do not give us the ability to differentiate between ‘successful’ and ‘failed’ claims – except perhaps through hindsight (Geels, 2007). This suggests that we need to reflect more carefully on the causal nature of expectations so as to be able to say something about their differential robustness and outcomes as well as to acknowledge the forms of work involved in their production.

New insights into performativity

Some of these issues have been the subject of discussion within recent scholarship in Economic Sociology and the Sociology of Finance. Two strands in particular might help us conceptualize more fully the market for expectations. In his work on financial markets, for instance, MacKenzie (2006: 16–18) investigates the influence of the Black–Scholes–Merton model on the derivatives market and develops a typology of different types of performativity. According to MacKenzie, some theories when they are applied have little or no observable effect on a setting, which he describes as ‘generic’ forms of performativity. Others ‘make a difference’ in some way when applied, which he deems ‘effective performativity’. Still others bring about the ‘states of affairs’ for which they are good ‘empirical descriptions’, which he describes – after the Sociologist of Science Barry Barnes – as ‘Barnesian performativity’, similar to the notion of self-fulfilling prophecy. Finally, some theories change economic processes so that they conform *less* well to their depiction by theories, which he describes as ‘counter-performativity’.

The second set of ideas is Callon’s (1998, 2007) attempt to recast the success of economic theory as a process of ‘world making’. He describes how theories emanating from the academy are ‘indexical’, meaning that they can only be understood with reference to particular circumstances, time and space. If these theories are to have influence they must create the context or, to use the term he prefers, ‘world’ to which they point. Successful theories are those able to create some form of ‘material reality’ or ‘obligatory point of passage’ that others are then forced to take into account. Those unable to mobilize

their world will fail. Importantly, this formulation draws explicitly on the idea from actor network theory that agency is configured within a network of both human and non-human actors. To reflect this, Callon (2007) describes the theories and the world they create as a *socio-technical agencement*, the latter term depicting a heterogeneous collection of material and technical elements that act on and adjust each other.

Both of these ideas can be applied productively to the discussion of industry analysts. We find MacKenzie's formulation useful as it provides for more precision when talking about the differential outcomes promissory work might have. Whilst not directly adopting his terminology, it is a practical inspiration for the *typology of promissory behaviour* developed below. Callon's conceptualization is valuable because it enables us to begin to discuss the forms of work involved in the production of expectations, which includes identifying their success and failure. That is, how certain kinds of promissory activities become obligatory points of passage (or not) for those working within technological fields.

The market for technological expectations

The market for future-oriented knowledge claims is a relatively recent phenomenon. It was only by the 1980s, for instance, that a few of the large management consultancy organizations began to collate and sell information about the new kinds of information technology (IT) available. This was followed in the 1990s by the growth in popularity of specialist commercial research firms, which gathered and traded information on vendors (Firth and Swanson, 2005). By the end of the 20th century, however, a new, influential class of knowledge producer developed and proliferated, heralding a much more elaborate system of consultancy and advice that attempts to subject vendor statements about new offerings to a more systemized and formalized evaluation (Pollock and Williams, 2009a,b). Today, these firms operate within a lucrative and prosperous market. They have expanded from a small specialist group of players, primarily based in North America, to hundreds of such firms operating throughout the world (Hopkins, 2007). These firms anticipate the evolution of new technical fields and of the business contexts that patterns their use and utility. This will include articulating and mobilizing support for generic technological visions (with some analysts aligning themselves with specific vendor visions). However, and importantly, a large number of these analysts try to subject the promissory work of specific innovation players to a certain level of scrutiny and accountability. Their work does not aim to generate specific promises, but to circulate different promises and expectations mobilized by others. It includes the production of expectations based on – and often critically oriented to – assessments about vendors and their offerings.

Despite its importance, there has still been little research on the market for technological expectations, or specifically on the role of industry analysts in organizing new technological fields. The few preliminary studies to date have mainly come from Information Systems research (Burks, 2006; Firth and Swanson, 2005; Mallach, 1997; Pollock and Williams, 2009a; Ramiller and Swanson, 2003). Drawing on a limited empirical base, STS scholars often adopt a more critical view of industry analysts, typically focusing on the 'simplistic' nature of research (see particularly

Bloomfield and Vurdubakis (2002), Borup et al. (2006) and Rip (2006)). For example, the Gartner ‘hype cycle’ discussed earlier is deemed to be ‘too general’, not allowing for ‘variation’ in technological evolution, and a tool that produces a ‘highly linear understanding of a technology’s path dependency’ (Borup et al., 2006: 291–292). These are fair criticisms, but there are other perhaps more productive ways to view this set of actors and their knowledge. One such way would be to examine the dual process of complexity and simplicity surrounding these tools. For instance, a more ‘Callonian’ reading would be to investigate how Gartner simultaneously engages with the market, with all its complexities, while also ensuring that such complexity can be represented with a simple tool. Furthermore, this might include analysis of how Gartner have extended this form of knowledge out into the world and how they have been able to build up such a large audience for this type of promissory work. It is this form of study that is attempted here.

Promissory organizations

We introduce the notion of a promissory organization because we think there is a lacuna in existing understandings of the market for future-oriented knowledge claims, and also because it allows us to make sense of the key roles certain intermediaries play within marketplaces. This notion highlights how particular firms like industry analysts both articulate generic visions of the evolution of a technical field and subject the promissory work of innovators to scrutiny. We define a promissory organization as an intermediary that routinely and prodigiously produces future-oriented knowledge claims. We suggest that these intermediaries do not simply reflect or represent the state of affairs in a particular marketplace, but actively contribute to its shaping. Industry analysts operating within the IT sector are exemplary, but further examples can be found in other domains, particularly those that are dogged by high levels of uncertainty and change (the life sciences, energy, health and environmental domains, and so on).

Promissory organizations have numerous interesting characteristics for studies of technological expectations. Latour (1987) has written that the modern scientific laboratory gains its strength as a place where diverse instruments are gathered together. Promissory organizations create themselves as centres of power by building a wide and variegated range of expectations and assembling the organizational machinery for disseminating them. This includes mechanisms and networks for developing and communicating ‘successful’ claims, but also those needed for dealing with more contentious, problematic and ‘failing’ claims. One of the most interesting things about industry analysts is that they produce prodigious amounts of research. Many of the larger firms make dozens of claims on a daily basis about a vast range of innovations. This begs the question as to how such large volumes of ‘envisioning’ are sustained. Moreover, while it is commonplace to conceive of their assessments as products of single analysts using the vagaries of individual discretion, the empirical material reported here shows that they result from more observable social and distributed processes. In what follows we discuss three examples of promissory work produced by one large industry analyst organization, but before doing so we provide some detail on how we conducted our study.

Studying promissory behaviour

Studying industry analyst firms and providing evidence of their (differential) promissory influence is difficult. Not only do these actors tend to be highly reserved and reluctant to discuss the detail and provenance of their research, but they also conduct their work both *within* and *across* various organizational spaces. One often has the sense when researching these firms of never being in the right place at the right time (a frequent problem for social science research into complex developments, as Law (1994) and Magolda (2000) observe). Important decisions or discussions appear to be taken elsewhere. Thus, in order to understand the differential influence of industry analysts, we had to use an eclectic research design. Rather than study industry analysts at a single locale, we tracked their influence in different contexts and across different issues. Our study was designed as much through opportunism and ‘luck’ as through theoretically informed choices. Gartner was one of the ‘surprises’ we came across when researching the acquisition, design and use of large packaged software systems, and once we became aware of their importance we attempted to study them whenever or wherever we could. We studied places where we could negotiate access (and difficulty with access is one reason for the relative paucity of studies), but also sought out particular sites. These choices were continually modified to address emergent phenomena and issues.

This paper presents three ‘vignettes’. The first episode introduced us to the influence of Gartner when one of us was conducting participant observation research on the procurement of an IT system at a local government office in England. At that time, for almost a year, we viewed Gartner’s influence from the point of view of their consumers. As the procurement team debated the pros and cons of various solutions, we were able to observe (and collect material about) the influence of Gartner’s recommendations and research. The second episode occurred a few years later, when we came across Gartner’s influence while conducting another study on the design of large packaged software systems. At that time we were able to observe how Gartner sought to construct one of its research documents (the Magic Quadrant). The final episode arose from our choice to attend international IT conferences and venues where we knew Gartner would be present, in order to observe Gartner’s interactions with other participants.

Infrastructural knowledge: Promissory-work made durable

The first vignette relates to how Gartner classify new classes of developing technologies. We see classification as a powerful way for industry analysts to shape innovation: they name technologies in a way that anticipates their trajectory of development, the particular shape they will take, the new players who will enter the market, and the demand for the technology, and so on. An important reason for our view of classification as a form of promissory work is that attempts to classify the characteristics of new technology markets often ‘fail’, as markets do not always emerge in the way anticipated. Technological classifications are similar to the ‘organizing visions’ identified by Swanson and Ramiller (1997), in the sense that they are subject to varying levels of support and momentum. However, when classifications are successful, they often become something of an ‘infrastructure’ (resources that sink into the background and only become visible when they break down (Bowker and Star, 1999)). We encountered such infrastructural knowledge

when observing Gartner's influence in our ethnographic study of the procurement of a complex information system by a local authority.

The new category of 'CRM'

'Melchester Council' (a pseudonym) was choosing a customer relationship management system (CRM) system as part of its e-government agenda. This system is now a required feature of organizational landscapes, but when the fieldwork was being conducted there was uncertainty about its necessity and design. The procurement was a protracted affair, and to speed things up Melchester engaged the services of the Gartner Group to provide background information on the suitability of one particular vendor, 'NewVendor' (a pseudonym) which had done particularly well with its sales pitch and had the support of various staff from the Council. However, some issues still needed to be resolved. The most pressing was that no one from Melchester had previously heard of NewVendor, and this lack of knowledge was causing uncertainty within the procurement team. There were fears about committing such an important project to an 'unknown quantity'. One apparently easy way to settle the matter was to ask Gartner to provide a 'vendor rating'.⁴ A Melchester IT manager (Ron) duly telephoned Gartner but was surprised when told by an analyst specializing in CRM (someone called 'Ed') that he could not provide a formal vendor rating on NewVendor because no one in the UK office of Gartner had *heard of them!* This analyst said he would cross-check with US-based colleagues and call back. He did so a few days later, but only to report how NewVendor were also unknown to his American colleagues. The IT manager circulated a note of the telephone conversation amongst the procurement team: 'Ed has been in touch with his colleague in the USA, but [NewVendor] were unknown to him as well. Gartner can therefore not provide any research papers into the company or its products' (IT Manager's circulated notes). Some days later the particular Gartner analyst wrote to the Council summarizing the telephone conversations and drew the following conclusions:

As a follow-on call we checked with two different CRM analysts in the U.S. Both belong to the call centre team and neither had heard of [NewVendor]. They take about 400–500 calls from clients per year. One focuses on call centre applications and the other on call centre infrastructure The Bottom Line is that ... we do not believe the [NewVendor] proposal is necessarily in the best interests of [Melchester]. (letter from Gartner)

What we see here is that Gartner cast doubt on NewVendor's standing, going as far as to suggest that Melchester should reject this vendor. The episode did not finish at that point, but took an interesting turn when NewVendor, informed of Gartner's opinion, attempted to play down its significance by suggesting that the problem resulted from a 'categorization' difficulty:

Their [NewVendor's] comment when it was pointed out that they were unknown to Gartner was that in the two years the company has been in existence it has not spent any time or effort in making itself known to industry analysts. This is because at present these companies do not have a category for what they are offering (the integrated framework approach). (IT Manager's circulated notes)

According to NewVendor, the problem resided with Gartner's classification of the CRM market, which was not wide or flexible enough to include the kind of services they offered. They described how they promoted a so called 'integrated framework approach'. To provide evidence of this they sent to the Council a list of how their offering differed from the more conventional kind of CRM covered by Gartner. Gartner responded by pointing out how a number of other more established CRM providers *already* offered the kind of innovation described by NewVendor. What followed however was then a complex and lengthy discussion between Gartner and NewVendor about the nature of CRM and the classification process.

Meanwhile the Melchester team became increasingly confused, and decided the best way forward in the absence of a formal rating on NewVendor was to ask Gartner to produce such a rating. Consequently, a US-based Gartner analyst met with NewVendor a couple of weeks later. In contrast to the first account, this analyst presented a somewhat more nuanced reading of the episode – emphasizing how NewVendor potentially had a 'broader offering' that did not necessarily 'fit' within Gartner's view of CRM. Indeed, the analyst told the Council that she was 'impressed' by NewVendor, especially their 'knowledge of their marketplace and their understanding of software evolution' (IT Manager's circulated notes). She concluded by advocating that Melchester should perhaps 'not read too much into the fact they were not known to Gartner' (IT Manager's circulated notes).

This latest report contrasted with Gartner's initial assessment. However, among the members of the procurement team, certain team members enthusiastically embraced Gartner's more critical comments and sought to marshal support from others to reject the vendor (see Pollock and Williams (2007) for a more detailed discussion). Shortly after the discussion with Gartner, the NewVendor solution was no longer considered a viable option for the Council.

To summarize, we have argued that Gartner shape innovation through proactively naming and defining new classes of emerging technologies. This is a process that does not simply allow industry analysts to represent the market/technology but also to shape it. Gartner project an initial definition of a class of technology, but rather than modify their definition each time they encounter a different case, they expect vendors to conform to their existing category. Those outside the classification, which do not conform to Gartner's definition, are seen as anomalies (Beunza and Garud, 2007; Zuckerman, 1999). Indeed, in the case described, because of Gartner's view of what the technology should look like, the vendor was not able to enter the particular marketplace. Thus, we can see how this kind of infrastructural knowledge (the classification) had a significant and enduring influence on the marketplace. It demonstrated a strong form of performativity, allowing us to describe technology and market classifications as *promissory work made durable*.

Visions let loose

This second vignette investigates the intriguing issue of how those who trade in future-based knowledge claims manage 'failure'. One might imagine these organizations have mechanisms for downplaying claims found to be inaccurate. This also begs the question of how failure effects reputations and credibility (cf. Brown, 2003).

Demonstrations of failure

Purely by chance we stumbled across a forum where Gartner dealt with failure in the most public of settings: in front of an audience of more than 200 practitioners attending an annual international industry IT conference. One of the authors of this paper was listening to a Gartner analyst give his keynote address, which he gave each year to this particular conference, when the speaker pointed out how he wanted to do things a little differently this time around:

What I have decided this year, because several of you have said, ‘You know it would be fun to take a look at some of the stuff you have said over the years, and if it makes sense today, or, if it doesn’t make sense. Or what it was, and what we talked about over that period of time’. So I went back even pre-Gartner when I was at CAUSE and picked out some of the slides. And I thought that I would start from about 1992, partly because that’s as early as my PowerPoint slide went back, I didn’t have anything that was in a form that I could use.⁵

What he proposed to do is go through previous claims to see if they turned out to be ‘accurate’ or not! He then set about reading through old PowerPoint slides, pointing out the predictions made and continually stopping to insert anecdotes as well as to invite the audience to confirm the claims by raising their hands. The first claim was about e-learning and future of traditional higher education:

In my first year at CAUSE some of you asked ‘What are some of your recommendations and some of your strategic planning assumptions? What do they look like?’. Here is some of them from 1996. That’s really 10 years ago now.

‘By 2001 distance learning will be a mainstream activity on 80% of the campuses.’

How many of you think that one has come to pass? How many of you [very few hands raised]. How many of you think it hasn’t yet [many more hands raised]. Mainstream activity? Still not. OK.

With the first slide, most of the audience seemed to agree that the analysts’ prediction had *not* ‘come to pass’. At this point, he paused for a few seconds, before making a slightly different point:

How many of you though have a large percentage of either hybrid or blended courses on your campuses today? [A few more hands are raised.] Yeah. OK. So part of it is coming there ...

He then addressed another prediction that ‘Western Governors University would have a dramatic impact upon higher education’. However before handing this claim over to the audience, he asked:

How many of you *remember* Western Governors University? [Laughter from audience.] Oh, yes! Oh, yes! [More laughter.]

The Western Governors University, like many of the other new for-profit virtual universities at the time, was largely a failure (Cornford and Pollock, 2003). Bob's acknowledgement of this and seeming irreverence towards his prediction was greeted with widespread laughter. He continued:

Western Governors Association Initiative. At that time I was on the task force for the Western Governors, and I tell you, if you ever want to see panic in Presidents' eyes, this one brought it about. The Western Governors, the idea that you have this group of states coming together in the form of a virtual university, *really* did have the attention of a lot of people. And I remember Presidents coming up to me and saying 'Am I really going to find myself in a situation where I am going to have to compete with universities around the world?'

These institutions did not have the direct influence that Gartner predicted but this does not deter Bob from qualifying and defending his claim by pointing to the wider effects they did have:

The point is, Western Governors started to shake thing up. And at the time of this particular Gartner and EduCause update I said 'If they never offer a course, Western Governors will be successful because they will have shaken up higher education to start thinking about technology and the role of technology in teaching and learning'. And I think that is true. The reality is that they haven't done too much from the point of view of offering course work and becoming an institution, although they were accredited.

From then on his presentation begins to follow a familiar pattern. We are introduced to a past claim: 'IT coupled with better business practices and co-operative arrangements can bring about both cost avoidance and significant savings'. The analyst then ironizes the claim: 'Any of you *seen* any significant savings ... ?' [laughter]. 'How about cost avoidance?'. Having questioned the claim's veracity he then attempts to convince the audience that the prediction contains elements of truth: 'Sometimes, yeah, we have. And there I have to say there are times when people see savings. The problem I find is that as we have done some of these savings *we* [the IT community] don't get credit for them.'

This episode is interesting because the audience is invited to evaluate Gartner's research and to look at what they said *would* happen compared with what *actually* happened. Gartner are airing their claims for scrutiny 'after the event' so to speak. Of course the particular analyst skillfully manages this process so that the fragilities surrounding this form of promissory work are never fully exposed and claims are not strongly contested. Rather, in some respects, he attempts to recast the claim in the present, so that both the prediction and present-day perspective are more closely aligned. We might read this episode as a set of unrealized promissory activities that are later discursively re-adjusted to match the setting and vice versa – a process Brown and Michael (2003) describe as 'retrospecting prospects'. However, while such a conclusion might be valid, we think the episode highlights a different point.

Callon (2007) has argued that theories are performative when they successfully bring about the 'world' to which they point; they create some form of 'material reality' or 'obligatory point of passage' others are forced to take into account. Applying this notion

to this vignette, we might say that promissory work does not exist in isolation but has meaning and efficacy in the world it creates for itself. Successful promissory work would be actively engaged in constituting the reality to which it points. However, in this case, Gartner appeared to neither build upon nor defend this knowledge, but simply to let the claim go. Thus we might say that promissory organizations sometimes produce and communicate a kind of knowledge with which they never attempt to do anything. The performative reading of this is that some types of expectations based knowledge have limited or ‘temporary’ effects. These expectations are simply launched into the ether: they are *visions let loose*.

Statements and their world

In this final vignette we turn our attention to a device called the ‘Magic Quadrant’. This has been developed by Gartner to compare technology vendors against each other according to a mix of present day and future based criteria. The aim is to provide information to IT decision makers about the current and future performance of technology vendors, their behaviour, and their understanding of the marketplace: Will they be around next year? Will they continue to invest in the market? Do they know what users’ want?, and so on. Coming in the form of a 2×2 matrix, the Magic Quadrant ranks vendors according to two specific Gartner developed measures: a vendor’s ‘completeness of vision’ and ‘ability to execute’. Depending on Gartner’s assessment of these features, the vendor is then placed in one of the four quadrants, labelled ‘niche player’, ‘challenger’, ‘visionary’ or ‘leader’ (see Fig. 1).

The Magic Quadrant is interesting to study as a form of promissory work because it is a widely contested but also highly influential ‘dividing object’ (Pollock and Williams, 2009a). It has been described as the most ‘influential tool’ in the IT marketplace, because a high ranking is said to guarantee a vendor more attention than rivals. Some analysts even argue that it has the power to ‘make or break’ a new technology, to create winners and losers (Violino and Levin, 1997). However, at the same time, it also has been denounced

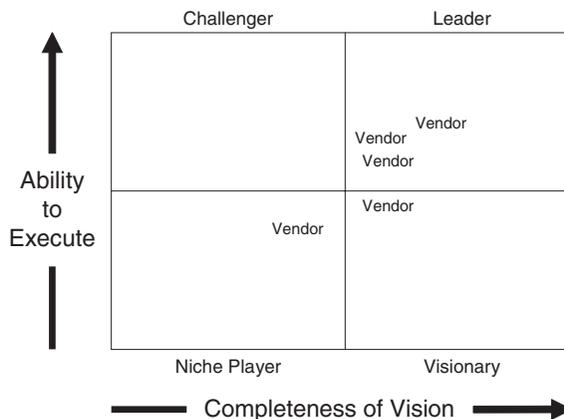


Figure 1. The magic quadrant

as devoid of ‘intrinsic value’. It has been called a mere ‘marketing tool’, which is overly ‘subjective’ in the way compiled, leading to accusations of ‘partiality’ and ‘bias’. There have been critical discussions of the limitations of the measures used for analysis. Such criticisms beg the question of how Gartner has been able to build up such a large audience for this type of promissory work. We suggest the tool is influential because it is (re)configuring the technological field. In particular, we argue that Gartner are actively creating a new ‘world’.

Setting out a new terminology

To give some indication of the new world the tool is creating, we present an extract from a presentation given by one Gartner analyst to a large audience of IT practitioners. He is talking about the history of decision-making within information systems procurement and begins by discussing how previous technology adopters had assessed information systems prior to purchase:

... we put together [in the 1990s] an outline of how you should evaluate administrative applications [A]nd what we said was that in a stable environment you would look at ‘*functionality*’ ...

What we said in ‘97 was change. You need to look at *functionality* but most vendor packages are mature enough to where there is at least common functionality, so it is a matter of *goodness of fit* that you are looking at (our emphasis)

Here we see that the speaker problematizes the traditional means by which people assess information systems (this move from ‘functionality’ to ‘goodness of fit’). His critique focuses on the assessment criteria people currently use, which, as he sees it, are no longer effective in sorting vendors out. He goes on to suggest:

And we started seeing that trend in the early 80s ... that said we had ageing of systems, people were using these systems. ... And the point is that you had to look at buying software as being a *partnership* with a vendor, and that’s a long-term relationship. It’s not something short term. (our emphasis)

The analyst adds that it has now become necessary to replace current assessment measures, because adopters tend to use the same solution for longer and consequently form ‘partnerships’ with suppliers. An implication of this is that organizational consumers need to assess not only systems but increasingly also vendors themselves:

And so, the *vision of the company* – do they understand the business of [specific sector]? Do they know where you were going? – and the *ability to execute*, those are still crucial. We still say it is about half of what your criteria should be (our emphasis)

The analyst is suggesting a shift in decision-making from the evaluation of functional and local concerns to more ‘strategic’ ones. In order to do this, he mentions

how a consumer might apply Gartner's own evaluation criteria ('ability to execute' and 'completeness of vision') when evaluating vendors. In this respect, it might be suggested that the Magic Quadrant is transformative – that Gartner are setting out a new way to evaluate vendors. However, the world that Gartner are attempting to set out also requires a research process. This turns out to be one of the most controversial aspects of the tool.

Constructing a research process

Gartner analysts produce new Magic Quadrants for particular markets or sub markets each year, and each year they 'reassess' a vendor's position. Gartner say that they collect evidence for their ranking from a variety of sources, which include research on vendors as well as discussions with the users of the technology. The latter are the customers of the particular vendors, and Gartner's relationship with these people is particularly interesting. We observed how one analyst had built up and was managing a large network of people with whom he regularly interacted. These people would continuously feed back information and opinions to him on particular vendors. Based on our fieldwork, we observed how a vendor ranking is enacted within these interactions. Following Callon and Muniesa (2005), we describe this network and the various interactions that go on within it as a 'calculative network'.

For instance, at a conference one of the authors was interviewing an IT manager when a Gartner analyst approached. The analyst who had been interacting with the IT manager for some months about the current performance of a software vendor we call 'SoftCo' began to tell him how he has just heard that SoftCo were already having difficulties with another user organization (UserOrg):

Analyst: Chris [from UserOrg] and I were just talking, she's, she has put some ultimatums out with them [SoftCo].

IT Manager: Yeah, the real problem with them [UserOrg] is that they have always written their own systems and they have gone for BoB [best of breed] but when they start hitting sort of a PeopleSoft or a [SoftCo] they think that it is going to be straightforward So, so she has got problems?

Analyst: She said that they are 2 million pounds over budget and they haven't *even* started implementation.

IT Manager: Oh, I think that a lot of that is going be, the guys from [SoftCo], the ones that I have been talking to. It is just that the account manager of the [nationality] is bloody useless.

Analyst: But that is a key ...

This interchange is interesting for the way the Gartner analyst began the conversation by highlighting SoftCo's failings. He did so by invoking a kind of 'community' view (it was not him but Chris from UserOrg criticizing SoftCo). In contrast, the IT manager attempted to defend SoftCo by shifting the focus back onto UserOrg's lack of experience with these kinds of large generic software packages. He also suggested that things were

improving, since SoftCo had just recruited ‘some really good people’. This exchange went on in this manner with both parties providing contrasting evidence. The IT manager was forcing the analyst to both explain and defend his assessment of SoftCo, which the analyst appeared able to do and *in a robust manner*.

Defending the new world

We are arguing that in such informal exchanges Gartner feeds what might be called ‘community knowledge’ back to the market. However, these kinds of ‘judgment’ are not easily objectified (Porter, 1995). For instance, during fieldwork we noted how Gartner often struggled to account for the provenance of community knowledge and how there was a certain amount of ambiguity surrounding the methodological status of the tool. We noticed for instance that in the early career of this tool, Gartner highlighted its ‘quantitative’ aspects, whereas in later years they described it as resulting from more qualitative research. Today Magic Quadrants are described as having a mix of both ‘objective’ and ‘subjective’ aspects (Soejarto et al., 2005: 5). When Gartner say the tool includes ‘subjective criteria’ we understand this to mean that it is shaped through analyst interactions with the wider community. Incorporating this kind of knowledge presumably increases the tool’s credibility, through giving weight to the argument that Gartner are close to practitioners, but it has also led to accusations of ‘partiality’ and ‘bias’.

Indeed, concerns about ‘bias’ were voiced several times to us during fieldwork. It was, for instance, the focus of an email exchange between one SoftCo Solution Manager and a customer:

Up to now I perceived their ... chief analyst being pretty vain – it is hard to turn his mind around just by facts. For the last Magic Quadrant we proved him being wrong in every single sentence of his comments to his (bad) assessment of [SoftCo], but I believe this has made him more negative about [SoftCo] than before. (Email from SoftCo to IT Manager)

One of the most striking features of these criticisms is their identification of ‘authorship’. Gartner are a large global organization but nonetheless our informants identified one particular analyst as the source of ‘negative’ assessments. We mention this because it contrasts with the strategies Gartner employ in an attempt to ‘objectify’ their knowledge. Whilst certain actors highlight the particularized nature of expertise, Gartner themselves are pushing in the opposite direction by attempting to demonstrate how these tools result from ‘collective’ almost ‘academic’, rather than individual, forms of expertise. For instance, a Gartner analyst described for us in an interview how Gartner were strongly committed to certain scholarly principles:

We are pseudo-academic in the way we work. We have a very rigorous peer review. So if I write something, it takes me 42 days to get it out the door. I can’t just write something, I can write it in a blog if I want, that is fine, but anything that is published within Gartner, I have to have two peer reviews followed by a manager, not a manager but a peer mandatory review, it is the kind of leader of that area who has to review. Then it goes up to a team manager, and then we can get

down to things like editing et cetera. And if it is something real big and controversial then it will go through much more reviews like that. So up to 16, 17 different individuals will review it, give you feedback on it and kick it to bits ... (Author interview with Senior Gartner Analyst)

Notions such as 'peer review', 'research methodologies', 'data collection' and so on are an increasingly common aspect of the vocabulary of industry analysts.

To summarize, we have shown how this form of promissory work has a strong but contested influence on the marketplace. Indeed the principal contention pursued here is that the Magic Quadrant has become 'successful' because it (re)configures the technological field. In particular, we argue that Gartner are actively creating a new 'world', which includes a new terminology that has changed how vendors and others conceive of IT procurement. This world includes a research process whereby Gartner can speak 'authoritatively' about the capacities and potential of IT vendors. Importantly, and even though their assessments are contested, Gartner appear able to defend this kind of knowledge. They do so by actively defending the rankings and the research process that sits behind them.

Conclusions

The *business of technological expectations* is increasingly commercial in orientation, product-minded in ambition and potent in influence. Crucially, whilst there has been extensive research on the efforts of scientists and technology developers to mobilize *particular expectations* around proposed technical advances, much less attention has been given to intermediary organizations devoted to the production, communication and selling of expectations-based products and services. We focused on the case of industry analysts who routinely produce various types of future-oriented knowledge that has consequences for shaping markets and products. We have termed these actors *promissory organizations* to capture how they successfully mobilize support for *generic* promises and visions (deploying signposts about the state of the industry and its future evolution), and also increasingly 'organize' expectations within procurement and innovation markets (subjecting the *particular* promissory work of innovation players to scrutiny and accountability). In a context of growing competition between diverse technology suppliers, articulating claims about the current performance and further development of their highly complex products, which are extremely difficult for potential adopters to assess, promissory organizations' serve to regulate and systematize that competition. The increasing influence of this kind of intermediary is changing the nature and dynamics of the promissory space.

The substantive aim of the paper was to throw light on how industry analysts shape innovation and markets, whilst our theoretical goal was to understand the extent to which their advice is 'performative'. How does this form of promissory work 'nudge' the direction of innovation and procurement choices? Arguably, current frameworks developed within sociological research on expectations do not allow us to answer this in a sufficiently comprehensive and nuanced way. The notion of a self-fulfilling prophecy runs the risk of treating emerging technologies as a direct *product* of expectations (Brown et al., 2000, 2003; Guice, 1999; Rip, 2006; van Lente, 1993), but scientific and technological

visions rarely demonstrate simple kinds of performativity. Even if seemingly stable beliefs are shared by relevant actors, one cannot ignore the possibility that other actors and factors may enter the field (Jørgensen and Sørensen, 1999). Scholars interested in the sociology of expectations need to ask why some kinds of consensus or compelling vision materialize while others do not. Clearly, not all expectations constitute innovation in the *same* way. Why is this? Why do certain forms of promissory work appear to be more successful? These questions underpin our insistence that it is necessary for scholars to develop complex analytical registers, in order to track the complicated and highly uneven levels of performativity associated with expectations. Richer analytical templates and rigorous methodologies are required. This challenge concerns whether it is possible to construct a *typology of promissory behaviour* that characterizes the unevenness of these commoditized forms of expectations.

Inspired by frameworks emerging from Economic Sociology and the Sociology of Finance, we used our empirical research to identify at least three different kinds of promissory work (see Table 1). The first is *infrastructural knowledge*, which typically attempts to classify technology markets. This type includes definitions of the technological field and maps of players within that arena. These classifications of technological markets are institutionalized, meaning that they exert a powerful and enduring influence. They endure because they are rendered invisible in the way Bowker and Star (1999) describe 'infrastructure' (as visible only upon breakdown). Second, we find more transitory forms of intervention that can be described as *visions let loose*. These are typically provocative signposts drawn up about the state and future development of the industry. These kinds of predictions appear not to be built in the same careful way as other kinds of research, but are simply 'launched into the ether', resulting in relatively short lived levels of influence. Finally, there are what we call *statements and their world* through which actors generate assessments of the location and potential of various suppliers within the product market for different user sectors. These statements have a strong but contested influence on the market, as analysts attempt to make their research successful with world-building activity.

We also noted how different types of promissory work are subject to variegated forms and standards of accountability and verification. *Infrastructural knowledge*, for instance, advances slowly and carefully as actors attempt to define the technological field (in some cases, to say what the next generation of technologies will look like) and to organize change in the marketplace. It is a form of boundary work through which analysts attempt to categorize technology vendors and markets in a very material way, according to existing classifications. Consequently, analysts who develop such knowledge may be blind to vendors who do not neatly fit their categories (Beunza and Garud, 2007). Such assessments are 'authoritative': whilst they can be (and often are) challenged, analysts tend to stick to original classifications (doing otherwise can diminish credibility – see Zuckerman (1999)). Similarly, *statements and their world* bring about 'accountable' change. This type of research must be accountable because it produces 'winners and losers'. Industry analysts attempt to be categorical about what is the right technology, in order to make purchases based on assessments of the current and future behavior and competences of vendors. *Visions let loose*, by contrast, are speculative and appear not to be subject to the same levels of rigorous accountability as other kinds of promissory work.

Table I. The business of technological expectations – A typology of promissory behaviour

	Kind	Effect	Accountability
Infrastructural knowledge	<ul style="list-style-type: none"> • Definitions and classification of technology markets • Strongly institutionalized (invisible until breakdown) 	<ul style="list-style-type: none"> • Organizing change in the marketplace • Strong and enduring influence (promissory-work made durable) 	<ul style="list-style-type: none"> • Advances in a slow and careful manner • Authoritative
Statements and their world	<ul style="list-style-type: none"> • Assessments of relative location of suppliers within product markets for different user sectors. • Active attempt to make research successful 	<ul style="list-style-type: none"> • Strong but contested influence • Creates winners and losers 	<ul style="list-style-type: none"> • Brings about 'accountable' change • Process behind tools robustly defended
Visions let loose	<ul style="list-style-type: none"> • Signposts drawn up about the state of industry and future development (longitudinal predictions) • Transient statements 	<ul style="list-style-type: none"> • Some but typically only 'temporary' influence 	<ul style="list-style-type: none"> • Speculative and low in accountability • Not subject to close scrutiny (or sanction)

Our typology suggests that there is a spectrum of promissory activity. At one end is promissory work that is researched and defended robustly, and which appears to 'matter' to promissory organizations and others who use it. At the other end are kinds of promissory work that seem more like 'provocations' that attempt to capture interest. Intriguingly, it did not seem very important when provocations failed, perhaps because such failures do not explicitly damage reputations. Contrary to what some have argued (for example, Brown, 2003), we found that mistaken predictions could be openly discussed in some public venues!

We sought *empirical* answers to the question of why certain kinds of promissory activities fail or succeed, but we do not necessarily think that the question should only be addressed empirically, especially if it is limited to *hindsight*. We advocate an empirical programme on the business of expectations, but with a theoretical orientation necessary to create a typology of promissory behaviour. In this paper, we identified three

types of promissory behaviour, but there certainly must be others that a more complex typology would encompass. The aim of such a typology is not to improve our ability to decide on the accuracy of promissory work – we are not suggesting that our analysis provides privileged access to the future (Barben et al., 2007).

Notwithstanding such limits, we can still say something about the promissory process (Geels, 2007), such as providing insight into the different moves and strategies that promissory organizations use; insight that may provide an understanding of the potential strength or weakness, robustness or fragility of particular claims. The upshot is that such research allows us to delineate some of the underpinnings of their success or failure (Barben et al., 2007; Geels, 2007), as can be seen most clearly in terms of the ‘webs of accountability’ identified above. Surrounding certain claims (*statements and their world*, for instance) there appear to be dense arrays of knowledge linking players together, as well as formalized and highly distributed processes through which data are gathered (resonating with what Callon and Muniesa (2005) call a ‘calculative network’). Moreover, this formal process is increasingly exposed to external scrutiny and comment. Whilst clearly not governed by the strict controls of independent ‘scientific’ or ‘academic’ knowledge, this kind of assessment is subject to its own forms of accountability, which deserve further study. Alternatively, *visions let loose* reveal a much less dense web of accountability and fragile links with little in the way of defensible knowledge.

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Notes

1. The Gartner Group is by far the largest and most influential of industry analysts (Burks, 2006; Firth and Swanson, 2002). Founded by Gideon Gartner in 1979, it has its headquarters in Stamford, Connecticut, as well as offices in various places around the world. It employs 4300 associates, 1400 of which are described as ‘expert analysts’ and ‘consultants’. The Gartner Group is divided into three main parts. This includes the organization of ‘events’, bringing together vendors and users to discuss the latest technologies. It offers ‘consultancy’ in the same way as more general management consultancy organizations. Finally, and this accounts for 80% of its revenue, it produces research.
2. This is not – and could not be – a complete or systematic typology, but is instead an initial attempt to investigate the potential for an empirically grounded characterization of the different ‘kinds’ of expectations produced, their variability in ‘effect’, and how they are subject to different ‘webs of accountability’. We see this as the opening stage in what will undoubtedly become a much more complex typology. We are also not attempting a ‘systematic’ typology because

promises and expectations are such all-encompassing features of human activity that it would seem presumptuous to generate an empirically validated map of promissory processes. Moreover, whilst there may be generic similarities between expectations, promissory organizations operate within particular contexts. We return to this issue in the concluding part of the paper.

3. This contrasts with some of the recent work from the sociology of expectations, which presents a rather linear or causal view of predictions. For instance, Borup et al. (2006: 286) write that expectations are both the 'cause and consequence of material scientific and technological activity'.
4. Vendor rating is a common service that most industry analyst firms provide. They are a mix of factual details about the vendor's history, its current and past customers, and its financial health, as well as opinions about its solutions, practices and strategies.
5. CAUSE is a US non-profit organization that has as its mandate the promotion and increased diffusion of information and communication technologies (ICTs) within higher education. It is today known as 'EduCause'.

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