Connecting the production multiple: Accounting as a fluid technology

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Abstract

This paper is about objects. It follows post ANT trajectories and finds that objects are multiple and fluid. Extant classic ANT inspired accounting research largely sees accounting inscriptions as immutable mobiles. Although multiplicity of objects upon which accounting acts has been explored, there is much more. This paper takes a post ANT view arguing that accounting is a fluid mutable mobile and that such fluidity enacts new realities thus making the object it acts upon more multiple. This is in consistent with our finding that is contextualised in a large Swedish based manufacturing company which was implementing sales and operations planning (S&OP) process to foster integration on its demand chain. Although actors wanted to see what it is to produc, that is to say, the object Production, as a singular object that could be diffused across time and space, Production became more multiple because the S&OP process itself is a fluid object, but there is still possibility to organise the messy Production. There are connections between the Production multiple and the managerial technology fluid. The fluid enacted the multiplicity of Production thus making it more difficult to be organised because there were always Other representations that enact new relations between presences, manifest absences and others. The multiple was organised in the sense that its mutually exclusive realities were managed by different constituents of the fluid located in these diverse realities. Accounting incompleteness in this sense attracts different absent local practices, which in turn make accounting fluid to account for the Production multiple. The accounting fluid brings together accounting inscriptions and particularity of locals. In the language of circulating references, reduction and amplification no longer go in opposite directions. They are all part of the fluid object. There is no single chain of circulating references that makes the object a matter of fact. Accounting fluidity means that references drift back and forth and enact new realities also connected to the chain. In this setting future research may not judge success or failure of accounting on whether accounting does solve the problem in singular but whether accounting is fluid enough to connect separate multiples.

Key words: STS, accounting inscriptions, representations, multiple and fluid objects, accounting incompleteness, ANT, S&OP
Introduction

This is a paper about two objects. One is called Production, that is to say, what it is to produce. The other one is accounting, more specifically, a sales forecast. Following Woolgar et al. (2008), *Does STS mean Business?*, we want to explore whether insights offered by *science and technology studies* (STS) could construct new spaces in business studies. Actually in accounting literature, using actor-network theory (ANT) to illustrate the performativity of accounting has been proliferating since 1990s (see Robson, 1991; 1992; Chua, 1995, Mouritsen, 1999; Mouritsen et al., 2001; 2009; Chua and Mahama, 2007; Mouritsen and Thrane, 2006; Briers and Chua, 2001; Dambrin and Robson, 2011; Skærbæk and Thorbjørnsen, 2007; Skærbæk and Tryggestad, 2010, and this is not an exhaustive list). They claim that accounting is performative thus enacting multiple realities of, for instance, inter-firm relationships (Mouritsen et al., 2001; Chua and Mahama, 2007), innovation (Mouritsen et al., 2009), and make or buy decisions (Mouritsen, 1999). Skærbæk and Tryggestad (2010) also found that accounting makes corporate strategy fluid. Therefore it can be concluded with confidence that the accounting literature has used STS’ legacy to problematise heterogeneous and inter-organisational phenomena by seeing accounting as an actor.

There are, however, two things that have been overlooked. Firstly, those organisational and inter-organisational phenomena are more multiple than what the authors have shown. This is because presence is made from absence just as absence is dependent on presence and there are always limitless Others that are yet to be brought into presence (Law and Singleton, 2005). Extant ANT inspired accounting research has recognised that objects are multiple because ontologies depend on their relations to Others. Relations are not stable, but this is only in concert with classic ANT (Latour, 1987; 1999) where the focus is on the talk of networks and relations. A concern about ANT is how this approach colonises Others (Lee and Brown, 1994). Arguably classic ANT did not address this very well (Law and Singleton). This calls for Post ANT studies on objects by seeing them in their presences, manifest absences and Others. Secondly, extant accounting studies using classic ANT tends to see accounting itself as an object in singular (with a few exceptions, for instance Quattrone and Hopper, 2005; 2006), though its impact is multiple. In other words, there is an asymmetry there in the sense that objects such as innovation and inter-organisational relationships that accounting acts upon are treated as multiples whilst accounting itself is regarded as a single. De Laet and Mol (2000) have shown that technologies can be rather fluid. This can also speak for the first problem mentioned above in classic ANT inspired accounting research. Objects that accounting acts upon are only limitedly multiple because accounting is not studied as a fluid object. Therefore what this paper aims to explore is the relationship between the object multiple and the object fluid. To do this and to see a more multiple object such as Production, we will pay special attention to objects as presences, manifest absences
and Others. It can be argued that this paper is a post ANT paper trying to realise the limitless multiplicity of objects. What makes this possible is to treat accounting as a fluid object, a *mutable* instead of an *immutable mobile*. In this setting, there is a more important aim of this paper, which is to explore the relations between multiplicity and fluidity, in order to construct some claims on how actors can device these relations in their purpose is to manage objects which they think is singular in theory but messy in practice.

If STS does mean business, this paper then would also try to offer some suggestions on integration in demand chain management (DCM). Conventional DCM literature tends to see the object Production as an object in singular and that it ought to be regarded as the same object for sales, factories and suppliers. If the managerial technology, for instance, sales and operations plan (S&OP) process, is not capable of doing so, it will be considered as a failure. Our argument may sound unreasonable but it reflects the ontological politics of what an object Production really is. We argue that because Production is an object which is multiple, it can easily be different things for different parties. Technologies can never succeed in the conventional sense because Production is not a singular object. What technologies can do for integration is to keep its fluidity in order to connect the multiple Production in diverse separate times and spaces. To integrate is thus to separate constituents of the technology that is supposed to foster integration.

As actors partaking in the S&OP process are keen to calculate a sales forecast to represent future customer demand, accounting completeness also becomes an object of discussion of the paper. Extant field study on accounting incompleteness has shown that incompleteness is either a problem what can be substituted with or complemented to other local practices (Jordan and Messner, 2012; Vaivio, 1999; Dent, 1991) or an actor that co-constitutes new practices (Mouritsen, 1999; Mouritsen et al., 2009; Jørgensen and Messner, 2010). This paper takes the latter view but aims to move the discussion further and to explore the micro processes of how accounting and other practices co-constitute each other when accounting inscriptions are seen as *mutable mobiles* as well as how local actors on one hand use incomplete accounting information when all seek to produce a complete sales forecast and on the other hand modify the constitution of such accounting information i.e. make accounting fluid.

The paper is organised as follows. The following section reviews accounting literature using classic ANT and explains the insufficiency this literature can achieve when it tries to study objects. This will lead to a discussion on post ANT studies on objects as multiples and fluids. The paper then describes some methodology issues, though there is no conventional section on research methods. The findings are then contextualised in empirical narratives, after which a general discussion is enacted, followed by some concluding remarks.
Literature Review

Classic ANT and its impact on accounting research

Classic ANT’s take on objects would arguably be inspired by Bruno Latour as immutable mobiles. Latour (1983; 1987; 1990) describe such objects as something that moves around, meaning that it is mobile, but holds their shape, meaning that it is immutable. This has set the foundation of the sociology of association (Latour, 2005) which advocates that any object/subject holds its shape in some relations to other entities which altogether co-produce a more or less stable network of associations. Society is flattened as associations (Ibid). Immutable mobiles have in this sense largely influenced accounting scholars in studying accounting inscriptions. Because of their stability and mobility, accounting inscriptions are immutable mobiles that foster control at a distance (Robson, 1992). Centres of calculation dominate local peripheries because they have immutable mobiles circulate between times and spaces without changing their shape. Centres can thus know what locals are doing though locals possess more knowledge on particularities. Immutable mobiles are reductions of localities and particularities (Latour, 1987), but they are also amplifications because they can travel, they hold their shapes meaning they are stable, and they can be combined with other immutable mobiles (Latour, 1999). Matters and forms thus constitute a chain of circulating references that produce a more or less stable network (Ibid). Accounting inscriptions thus circulate with other entities with an effort to create more or less stable networks of associations. Constructing these networks has therefore been the core property in ANT inspired accounting literature. These networks include budgeting systems (Preston et al., 1992), a DCG (diagnosis-related group) – based accounting information systems (Chua, 1995), inter-organisational relationships (Mouritsen et al., 2001), an activity-based costing system (Briers and Chua, 2001), performance measurement systems in a supply alliance (Chua and Mahama, 2007), innovation (Mouritsen et al., 2009), performance measures in pharmaceutical industry (Dambrin and Robson, 2011) and a Balanced Scorecard (Qu and Cooper, 2010).

The abovementioned accounting studies largely follow the classic ANT view that it requires tremendous efforts from heterogeneous actors to maintain more or less stable networks of associations, but this is exactly the problem of the classic ANT. Although it sees objects in their ontological politics in terms of relationality – that what an object is depends on its relations to other entities, it still believes that objects are more or less stable networks of associations. We have seen a more or less stable network of associations constructing the budgeting systems (Preston et al., 1992). We have seen a somewhat stable network of associations producing a DCG (diagnosis-related group) – based accounting information systems (Chua, 1995). There is a more or less stable network of associations creating new inter-organisational relationships (Mouritsen et al., 2001). Innovation is not inherently about innovation itself. It is an effect of a
more or less stable network of associations of calculations, strategies and technologies (Mouritsen et al., 2009). A temporarily stable network of associations contributing to the emergence of a corporate strategy is there (Skærbæk and Tryggestad, 2010). A broken circulation of performance measures in pharmaceutical industry was fixed (Dambrin and Robson, 2011). A stable Balanced Scorecard was eventually built (Qu and Cooper, 2010). It is of great necessity to hold the relations up and to maintain the network. Classic ANT ‘explores how objects become relationally stable’ (Law and Singleton, 2005, p. 337), but is it too rigid? Do objects have to be maintained and sustained?

**A turn to contemporary or post ANT and its implication on accounting research**

There is one primary limitation in the classic ANT and it has a huge impact on existing accounting research using ANT. This is its thriving on maintaining objects as more or less stable networks. Recent STS scholars have shown new object lessons. Mol (2002) in her classic writing *The Body Multiple* has shown that lower limb atherosclerosis is different ontologies in the general practitioner’s surgery, the hematology laboratory, the radiography department, the physiotherapy service and the operating theatre. It is a multiple. Law and Singleton (2005) have shown that alcohol liver disease is also different ontologies in the hospital, in the substance abuse centre and in the GP’s surgery. In the hospital, it is a lethal condition that calls for abstinence. In the substance abuse centre, it is a problems calling for regulation. In the GP’s surgery, it is something that is at least better than recreational drugs. The object lesson tells us that objects are enacted as multiples in practice. Mol (2002) thus claims that things are in theory singular but in practice multiple. If objects are practically multiple, why stick so much on stable networks? Is it not so liberal democratic as ANT promises? Is classic ANT’s strength of liberalising objects paradoxically refuted by itself?

Bruno Latour must have recognised this self-contradiction and made a turn to a new ANT in his recent contribution *Reassembling the Social*. He turned to believe that objects be treated as *matters of concern* instead of *matters of fact*. *Matters of fact* are cold and indisputable, but he states that there is no relationship between being indisputable and being objective (Latour, 2005). Although this is not a leap of faith from the classic ANT, the subtlety has posted a question mark on the claim that actors are taking efforts to sustain the more or less stable network of associations, that actors are trying to close *matters of concern* into *matters of fact*. According to the Latin etymology of definition, “every de-inition (a closure) is also a de-finition (an incomplete order)” (Quattrone and Hopper, 2006p. 234). Thus, every attempt to close a quasi-object into an object, i.e. to de-fine, is to attract diversity that is different from itself, i.e. to de-fine. “...incompleteness and its constitution enabled to engage different constituencies simultaneously” (Ibid, p. 236). Therefore an ontological deduction is that every attempt to close (quasi) - objects *matters of concern*
into matters of concern attracts diversity and difference. A philosophical deduction is that closing matters of concern creates more matters of concern. Objects will become new objects. Objects are never singular.

Post ANT scholars believe that, yes, objects are networks of associations (Latour, 2005), but they are multiple (Mol, 2002) and fluid (De Laet and Mol, 2000; Law, 2004; Law and Singleton, 2005). We have shown examples above on how objects such as lower limb atherosclerosis (Mol, 2002) and alcohol liver disease (Law and Singleton, 2005) are multiples. De Laet and Mol (2000) give an exemplary narrative showing that how the Bush Pump in Zimbabwe was a fluid object when it became widely diffused in villages. It was fluid because its physical shape had been modified over time and across space. It became deviating from its mechanical configuration and actually the designers were stunned by the fact that the bush pump kept working even after some of its parts were broken. At the same time it was also a multiple. It is a technical device that produces water. It is about health in the country. It is also the national policy of shaping collective activities amongst villagers. The object not only travels but also changes its shape. It is a mutable mobile (Law and Singleton, 2005). Law and Singleton (2005) moves the discussion on ontological politics a little bit further by stating that stability depends upon changes. For instance, to make it be successfully diffused, the bush pump had to be fluid, that is to say, to be adaptable. This is a subtle difference to the classic ANT. In the classic ANT, actors need immutable mobiles to sustain more or less rigid networks, for it fosters centralised control at a distance. In this post ANT view, actors need mutable mobiles in order to construct more relaxed networks, for networks of associations also change if objects are multiple and fluid, according to the ontological stance of relationality. This ontological shift poses another set of normative questions. If objects are ontologically multiple and fluid, why should actors take efforts to sustain its stability? If stability depends upon change, should actors not look for less rigid technologies, in case of business, of managing, for instance, accounting? One might say, just because objects are multiple and fluid, we need immutable mobiles to manage them. Mutable mobiles will create a mess. Is this so? This is exactly the question that this paper aims to answer.

Our belief is that the terms of multiplicity, fluidity, immutable mobiles and relationality are more coherent with ANT’s view on objects. Hence the paper is not an anti-ANT paper but aims to offer new ways of studying ontological politics in business studies, and more specifically, in accounting research, but before we dedact how they may have implications on ANT inspired accounting research, we think we need include in our already heavy collection of ANT terms some non-ANT terms. They are presence, manifest absence and Otherness. Law (2004) write a comment on what these terms mean. Presence goes with manifest absence, for presence depends upon its manifest absence. Manifest absence is something out-there that can only be made present in-here. Presence is any kind of in-here enactment of manifest absence out-there.
In accounting this is obvious with accounting representations. What is a cost? It is a manifest absence out-there which can be brought into presence in-here in accounting representations. It is not only limited to representations. We just have an example of our own, not accounting though. What is fun of studying STS? It is a manifest absence which was brought into presence by some dinner chat of reading STS between me and my colleagues. One was sitting with me and the other one was replying to our post on Facebook. Actually the post and replies on Facebook also brought into presence the manifest absence of fun of studying STS. Otherness is something that is not made manifest, for it disappears. It disappears because it has been routinised hence nobody is interested in it any more. For instance, the fact that product cost comprises direct and indirect cost disappears in the representation of cost because it has been routinised. In our own example of fun in STS, we didn’t criticise the tradition of STS in problematising objects because it has been routinised. It disappears because it is also not interesting. In the cost example, whether the object on which we assign a cost does not matter because we are interested in what it costs instead of what it is. In our example of fun in studying STS, we didn’t discuss agency theory because it is not an object of discussion in STS and it is not interesting. It disappears because what is brought into presence and manifest absence cannot be sustained unless it is Othered. In the cost example, a presence of cost, which is a manifest absence out-there, in accounting representations in-here is not possible unless it is Othered from quality. In our own example, bringing the fun of studying STS, a manifest absence, into presence in terms some dinner chat involved a discussion on presence, manifest absence and Others. This was not possible unless our discussion was Othered from discussion on other themes of STS. Of course these disappearances are overlapping.

We argue that exploring the multiplicity and fluidity of objects is an empirical and methodological challenge. It provokes continuous search for absences and manifest presences. To do that we need continuously follow how representations bring something that is manifest absent into presence. This means we have to following those circulating references, but not a single chain of circulating references as Latour (1999) states. Because objects are fluid, references do not only go forwards or backwards on the reversible chain of circulation. Instead they may drift into new times and spaces as objects change their shapes. It also provokes continuous search for Otherness. To do that we also need continuously explore what the Others are absent in existing ontologies of objects. For instance, can something other than cost that also speaks for the object we are interested in? Because objects are multiple, a single circulation is not enough. There may be multiple realities and thus multiple mutually exclusive chains of circulating references that all belong to one object.
We argue that presence, absence and Others will have huge impacts on studying accounting and other objects upon which accounting act because the former has not been studied as a fluid object and the multiplicity of the latter has not been sufficiently explored in class ANT inspired accounting research, for most of them have treated accounting as *immutable mobiles* (Robson, 1991; 1992; Chua, 1995, Mouritsen, 1999; Briers and Chua, 2001; Mouritsen et al., 2001; 2009; Mouritsen and Thrane, 2006; Chua nánd Mahama, 2007) Dambrin and Robson, 2011; Skærbæk and Thorbjørnsen, 2007; Skærbæk and Tryggestad, 2010). Accounting travels across time and space but its ontology is taken for granted. How accounting itself is constructed as a fluid technology is overlooked and this paper argues that it has some implications on linking accounting technologies to the various objects they try to manage.

This is not to say that the abovementioned studies do not offer insightful knowledge with respect to accounting technologies and their associations with diverse organisational agendas. For instance, Briers and Chua (2001) is a detailed and local ethnography studying how cosmopolitans and local actors as well as boundary objects construct weak or strong associations that lead to the production of an ABC system. They offer new insights on the role of boundary objects in holding ‘actor-worlds’, on performativity of soft and hard numbers thereby calling for a blurring and hybrid view of the two, and more importantly on success and failure of accounting. They cite Latour (1987) and claim that ‘history of technoscience’ (p. 259) is the history of recourses enrolled in networks to ‘accelerate the mobility, faithfulness, combination and coherence of traces that make action at distance possible’ (Latour, 1987, p. 259). Therefore, for accounting to succeed, it needs to become an *immutable mobile* to maintain mobility, combinability and stability (Briers and Chua, p. 266). They argue that the ‘plant integrated standard costing system’ (PISCS) was abandoned because it lacks the three properties of an *immutable mobile*. For instance, it was unstable because standards were not updated and cost coding lacked discipline (Ibid). There seems to have some contradiction here. The PISCS did not work because it did not change, but this is what is called an *immutable mobile*. It travels but it does not change its shape. This paper argues that in fact Briers and Chua (2001) are saying that the PISCS was withdrawn because it is not a *mutable mobile*. It did not work because it did not change its shape. Had standards been updated and cost coding been disciplinary, it would have worked. This further challenges Latour’s (1987) view on *immutable mobiles* and action at a distance. This paper argues that they are necessary but they do not cope with change which is the norm in social science (Law, 2004).

Also this paper argues that it may be problematic to treat the PISCS and ABC systems in Briers and Chua (2001) as separate objects. The costing system in the case company appears to us more like a fluid object because ‘although the PISCS was ‘decommissioned’ in early 1990, several of its data capture procedures,
which were dispersed across the organisation, continued to operate. Machine hours, for instance, continued to be recorded for the hot line in total and not for the individual machines that make up the hot line (as required by the ABC model). Also scrap metal data continued to be accumulated at the ‘cost centre’ level and not at the product level, again as required by ABC (Briers and Chua, 2001, p. 267). Therefore some elements of the PISCS were kept and the ABC model was added to it or it could be other way around. It seems inappropriate to say that the PISCS was decommissioned and the ABC was triumphal. In a sense the object of Costing in Briers and Chua was not only multiple but fluid.

Briers and Chua (2001) is a paper on accounting change, but there are also other changes, for accounting change has enacted other realities, for instance, whether or not to produce the plate. Let’s call this object Production of the Plate. This is also a multiple. There is the Production of the Plate by the PISCS, which ties the twin managerial concerns of cost control and product proliferation. The effect is that production of the plate should continue. There also the Production of the Plate by the ABC, which ties the new strategy of product rationalisation, industrial engineers seeking continuous improvement and accountants trying to enhance their credibility. The effect is that the plate should be withdrawn from the product portfolio. If Costing is a fluid object, it seems that it is also flexible enough to handle the Production of the Plate multiple.

This may also apply in Chua and Mahama (2007) where a performance measurement system looks like a fluid object and it enacts different buyer-supplier relationships, meaning that the fluid accounting system is used to manage the Supply Alliance multiple, and in Chua (1995) and Preston et al. (1992) where the fluid new accounting systems and the budget are constructed to manage the Hospital and Hospital Management multiples respectively. It may also be the case in Mouritsen (1999). It can be argued that the fluid accounting is capable of managing the Strategy of Subcontractor’s Management Control multiple. The calculation of contribution margin calls for outsourcing whilst the one of ABC calls for insourcing. This paper argues that accounting calculations in his study is not different but fluid, for accountants can always calculate what a contribution margin is and what a cost is using ABC using the same information. Same claim could also be made in Mouritsen et al. (2009) where the fluid accounting happens to handle the Innovation and Technologies multiples. The interesting question becomes whether mutable mobiles capable of continuing the job of managing that immutable mobiles are not able to do, that is, what is it beyond action at a distance that is needed to manage objects that are messy? Qu and Cooper (2011) state that ‘the features that make inscriptions mobile and fluid also makes them susceptible to resistance and change and to become unstable in action especially over long distance’ (p. 357). It is not clear in their study on whether they see inscriptions as immutable or mutable mobile. There is also some confusion in this
Fluidity is the cause and change is the effect. In other words, they see fluidity as a problem and change as a solution, but fluid objects are changing over time (De Laet and Mol, 2000). This motivates this study to explore whether fluidity causes or solves problems. More specifically, it inspires this study to see if immutable mobiles can enact stronger associations when they become mutable.

The abovementioned insightful studies, however, all see accounting as an immutable mobile. They have shown that accounting enacts objects as multiples, but multiplicity could have been much more. There are many other Others. We argue that studying objects as multiples has been restricted by not seeing accounting as a fluid object in these studies. Because of relationality, when the fluid object changes its shape, it also creates new realities of the objects it acts upon. This study wants to keep this symmetry and aims to explore the relations between objects as multiples and objects as fluids and how they connect each other. We argue that this will attract those very Others that have been Othered when focus is on immutable mobiles.

Some studies have noted the limitations of accounting inscriptions as immutable mobiles in managing objects as multiples. Vaivio (1999) illustrates how immutable mobiles fail to gain momentum in managing the Customer, for the Customer is a multiple. A set of non-financial measures used by Commercial created the Quantified Customer. They foster action at a distance, make visible trends of various aspects of operational performance, and triggers action for key issues, but they finally retreated because they were defeated by the Sales Customer which was enacted by local specific ‘real problems’ and ‘ad hoc’ actions. Accounting inscriptions in this ethnography were mobile, stable and combinable, but they were defeated by daily dealing with customers. Centres of calculation, contrary to Latour (1987), were dominated by locals. There was no longer a symmetry between reducing and amplifying effects of circulating references (Latour, 1999). Amplification did not work because there was too much reduction. This study also tries to explore if mutable mobiles can better work with locals and particularities.

Another inspiration of studying fluid and multiple objects comes from Skærbaek and Tryggestad (2010) who state that heterogeneous accounting inscriptions frame and reframe corporate strategy of the ferry division (now known as Scandlines) of the Danish government-owned railway company DSB. The corporate strategy, whether it was a fluid (as the authors use the term adaptation) or a multiple (different strategies were enacted) object, was performed upon by different accounting inscriptions. For instance, calculations of payback period obscured capital investment because it only took into account early retirement expenditure and overlooked long-term benefits of, for instance, investing in new ferries. IPO, on the other hand,

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1 Qu and Cooper (2011) still see accounting inscriptions as immutable mobiles because they state that they enact stable relationship between the inscriptions and their contexts.
stemming from the independence of the division, encourages capital investment. Their study insightfully shows that fluid or multiple objects can be managed by diverse accounting inscriptions. Because the authors state that some of these inscriptions are related, for instance, IPO was dependent upon a company identity, which cannot exist without the balance sheet and other annual financial statements, this study is thus interested in exploring whether particular messy organisational objects can be managed if accounting is structured as a fluid object, for we argue that it is exactly these relations between accounting inscriptions that create the space where accounting can be made fluid.

There have been ANT inspired accounting ethnographies that see the potential of accounting inscriptions as *immutable mobile*. Quattrone and Hopper (2005; 2006) studies how ERP systems are constructed and change the spatial relationship between centre and peripheries. ‘Introducing ERP into MNOs led organisational actors into a ‘space-time odyssey’ – a journey marked by struggles, and changing perceptions of distance’ (Quattrone and Hopper, 2005, p. 743). They show how ERP evolves over time and is equipped with different properties, thus, becoming a ‘boundary object’ (Star and Griesemer, 1989; Briers and Chua, 2001), not only attributed to interpretive flexibility, “but also to its ontology, as IT is already many things” (Quattrone and Hopper, 2006, p. 220). The ideal of SAP, being “[global) integration”, “common”, “simple” and “real time control” induces presences, for they are discussed in their absences. In their study, from the outset participants refer to SAP, but only as an abstract technology because it lacks functionality; but it is exactly this absence that establishes its presence for users that wish to establish its presence “by precipitating enactment of a simple three letter acronym – common, global, [and] simple” (Woolgar, 1981). These three words then becomes the minimal configuration of the SAP which actors are often referring to. However, to operationalise these abstract ideals, accounting must be attracted and enacted to qualify SAP as an operative IT system giving visibility to other things (Quattrone and Hopper, 2006; p. 228). Accounting inscriptions are partial representations because they are incomplete. As is alleged by Quattrone and Hopper (2006), “making items visible also involves absences, for one way of seeing precludes seeing something else” (p. 229). Seeing IT as a fluid object and accounting inscriptions as twins of absence-presences, they found that organisational distance between the centre and peripheries is a multiple. ‘Thus the organisational became a-centred. i.e. there was no single centre for accounting inscriptions’ (Quattrone and Hopper, p. 759). Inspired by their insights, this paper seeks to explore how accounting as a fluid object will enact new space-time and whether this creates new problems or closes matters of concern.
**Accounting incompleteness**

Accounting incompleteness has been debated amongst different paradigms of accounting research. Whilst positivists see accounting as a representational practice which mirrors certain organisational phenomena, constructivists and interpretivists bring to the fore the array of actions that accounting incompleteness produces. Incompleteness is a problem in need of repair through, for instance, a better standard setting, to positivists. To constructivists and interpretivists, however, it may or may not necessarily be a problem.

Problematisation on accounting incompleteness in this paper only deals with non-positivist accounting researchers. For those scholars who see incompleteness as a problem, they proposes enabling controls as solutions, for the latter increases flexibility in using accounting information, insofar as there are always other non-accounting discourses or knowledge facilitates decision making (Adler and Borys, 1996; Chapman, 1997; Ahrens and Chapman, 2007). Resonated with this literature, Jordan and Messner (2012) found that handling performance indicators in a flexible way treating them as means rather than ends addresses the problem of incomplete performance indicators. Such enabling way of using accounting information to some extant reduces the tension between accounting and non-accounting practices. For instance, in Jørgensen and Messner (2010), actors account for appropriateness of NPD practice not primarily on accounting inscriptions but also on local practice of strategising. This is possible thanks to the enabling accounting for profitability. Enabling controls bridge otherwise separate and competing knowledge, for instance, the quantified customer and the sales customers in Vaivio (1999), for such controls let these knowledge and practices talk to each other. In both cases, however, accounting incompleteness is seen as a problem. It is either substituted with (Vaivio, 1999) or complemented to (Jørgensen and Messner, 2010) other practices.

There are also cases where accounting incompleteness is performative in the sense that it produces new practice. In Mouritsen (1999), neither contribution margin accounting nor activity based costing could completely represent the production space, but both enact new strategies dealing with inter-organisational relationships. Similar performativity is narrated in Mouritsen et al. (2009) where different accounting inscriptions produce different relations between inter-organisational relationships and innovation strategies. Dambrin and Robson (2011) offer an interesting case where even flawed measures construct performance of drug reps in the French pharmaceutical industry. All these studies lead to the conclusion that the linear view of action at a distance is way too simplified.

This paper also aims to move the discussion on accounting incompleteness further. Existing literature has shown that accounting and other practices co-constitute each other, whether incompleteness is seen as a problem or an actor. This study wants to explore the micro processes of how they co-constitute each other when accounting inscriptions are seen as *mutable mobiles* as well as how local actors on one hand use
incomplete accounting information when all seek to produce a complete sales forecast and on the other hand modify the constitution of such accounting information i.e. make accounting fluid.

**What does this mean to business?**

The enquiry into objects manifested in their relations between their multiplicity and fluidity is contextualised in a business setting where Swedtech (a pseudonym) was implementing a managerial technology namely sales and operations planning (S&OP) process to foster demand chain management (DCM). DCM differs from supply chain management (SCM) in its focus on the marketing, sales and service part of the value proposition, and starts with the obtaining of detailed information about prospective customers (Van Landeghem and Vanmaele, 2002). The integration of SCM and DCM is seen as a critical movement for the supply chain in order to deliver the right goods and services to customers (Lee, 2001). Vollmann et al. (2000) state that ‘DCM is a set of practices aimed at managing and coordinating the whole demand chain, starting from the end customer and working backward to raw material supplies’. In Swedtech, the purpose is to create a consensus sales forecast for the medium to long-term horizon between sales and production because of existing inventory shortage. Applying the terms we have just discussed, the purpose is to create a presence, a representation in-here, that brings about the manifest absence of future customer demand. Therefore, the managerial technology is trying to create a presence of what it is to produce, which in this paper is called an object namely Production. Exactly as what Mol (2002) cogently claims, objects are in theory singular but in practice multiple. Swedtech wanted the object Production to be a single object so that it can be diffused across the demand chain, but when it was implementing the S&OP process where the S&OP sales forecast was the obligatory passage point for the efforts to sustain a stable network of associations of Production, the object became multiple and the technology itself became fluid. Some of its constituents were continuously added and some elements of its minimal configuration became withdrawn. There are many Other representations that enact multiple realities of relations between presences, manifest absences and Others.

The enquiry is normative. What should Swedtech do to foster integration between sales and production? The same question becomes what it takes to produce the Production in singular. This is a very class ANT enquiry. We want to take a slight detour by asking another question. Can Production be constructed as an object in singular even after actors thrive on doing so? Is coherence better for business? In the bush pump case coherence does not work well for the diffusion of the object (de Laet and Mol, 2000), but in organising alcohol liver disease, coherence is just what it lacks. As Woolgar et al. (2009) and Latour (2004) suggest, STS should ‘endow the word ‘constructivism’ with a positive meaning’ and to do this ‘it should be protecting and caring for matters of concern rather than about ‘debunking’ matters of fact’ (Latour, 2004, p. 232).
Although this paper advocate the use of *mutable mobiles* as well as ontological politics comprising presence, manifest absence and Others, it still aims to find out what the object Production is and what the object the S&OP sales forecast is. More importantly, we also want to construct a claim on how actors can device relations between multiplicity and fluidity in order to manage objects which are inherently messy.

**Research methods**

This paper utilises Law’s (2004) and Latour and Woolgar’s (1986) reflection upon the mediation of research methods on theorisation and knowledge production. Law’s (2004) reflection on knowledge production in social science starts with a discussion on *inscription building* in laboratories. According to Latour and Woolgar (1986), a laboratory is a system of material/text translation where material resources are transformed into texts and that more or less stable similarities are transformed into *substances, facts*. Realities are thus *constructed* by inscriptions devices.

Law (2004) then takes a journey around metaphysics of realities as *out-therenesses* and reflects upon how Latour and Woolgar (1986) problematise the *out-therenesses* of realities differently from Euro-Americans. Properties discussed include *independence*, whether the external reality is independent of our actions and perceptions, *anteriorty*, whether the external reality exists before us, *definiteness*, whether the external reality is composed of a set of definite relations, and *singularity*, whether the external reality is the same everywhere. Law (2004) states that on *independence* and *anteriorty*, ANT sees realities are associated with the apparatus of *inscription producing*. On *definiteness* and *singularity*, ANT also sees realities as effects of the apparatus of *inscription building*. Producing inscriptions therefore are vital in generating scientific power/knowledge thus cannot be separated from the *out-there* realities. Law (2004) describes those inscriptions produced yesterday as hinterland of today’s statements, modalities. “It is not a matter of words representing things. Words and worlds go together” (Ibid, p. 33).

“But this means that as the modalities disappear, so too do almost all of the processes in which statements and realities are produced. The largest part of the work that has gone into their production is deleted. In the end, the inscriptions devices themselves disappear, though those that are most novel are likely to retain a foothold in the ‘method section’ of scientific papers. But it is the ‘subjective’ and the ‘personal’ that disappears first. The traces and the statements in the laboratory are used ‘in such a way that all the

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2 Law (2004) uses this term as an index for those “more or less hegemonic set of claims about method, notwithstanding the divergences in practices” (p. 165).

3 This is also Latour’s (1999a) argument for studying social science as circulating references.
statements were seen to relate to something outside of, or beyond, the reader’s or author’s subjectivity’ (Latour and Woolgar, 1986, p. 84).” (Law, 2004, p. 36)

This reflection on inscription building points to a fallacy of the conventional main stream Euro-Americans, to whom realities come first and inscriptions come later as representation of the former. It is the other way round! It is “the processes of comparing, contrasting, and weighing up inscriptions that produce reality...It is arguments, debates, discussions or controversies that produce reality” (Law, 2004, p. 37). It is not reality that settles any disagreements via setting rigid methodological rules. Methods where inscription building plays a vital role construct realities.

This reflection upon research methods is consistent with Quattrone and Hopper (2005; 2006) who build upon Latour (1988) alleging that scientific methods are bundled with theorising but are not neutral representational tools and Woolgar (1988) viewing scientific methods as mediating the connection between the object of the study and its representations. As researchers need reflect upon a concept as part of the object they wish to represent (Woolgar, 1988), and the perception of ontology shapes a particular epistemological underpinning, which in turn points to the character of the methods hence the nature of representation (Woolgar, 1988; Chua, 1986), “scientific methods become the problem rather than the means for investigation” (Quattrone and Hopper, 2005, p. 743).

This is in concert with our earlier reflections upon object lessons by post ANT scholars. Research methods are just representations that bring some manifest absences out-there, for instance, validity and reliability, into presence in-here, but what are validity and reliability of empirical data? They are also multiples that are realised out of a set of relations between presences, manifest absences and Others. There is no research method capable of discovering the reality out-there in singular, for reality is ontologically multiple.

If the purpose of the research method section is to convince the reader that our data is valid and reliable so that our research is able to unravel something existing out-there and in singular, then this paper won’t write that research method. We think probably the use of M.C. Escher’s composition Print Gallary already used by Quattrone (2011) may echo our claim. The composition is shown below.
Figure 1 *Print Gallery* 1956, Lithograph, by M.C. Escher

There are two reflections from this masterpiece. Firstly, what we observe becomes part of our world. We are always within what we are observing. This is consistent with the infamous Copenhagen principle of quantum mechanics namely the complementary principle, which says whether the quantum is a particle or a wave in dependent upon the experiment apparatus used. Research methods do not discover an independent reality in singular. Instead they enact realities in multiple. Secondly, the composition is incomplete because there is a hole in the middle. It is mathematically impossible to complete the *Print Gallery*. This is also what Esher always believes, drawing is deception. Representations are always incomplete because although they bring manifest absences into presences, there are always Others. Therefore research methods are objects that are indifferent from the objects we have discussed so far. Research methods are embedded in empirical settings where both research methods and lay actors contribute to the enactment of multiple realities, which in our case are Production and the S&OP sales forecast.

**Empirical narratives**

**Background**

The field study was conducted in a Swedish based large bearing producing company, Swedtech. Its product range comprises five platforms including bearings, seals, lubrication systems, mechatronics and services. Its
customers encompass a wide range of industries including aerospace, agriculture, automotives, compressors, construction, electric motors and generators, electric power tools, food and beverage, home appliance, oil and gas, industrial fans, pumps and transmission, racing, solar energy, and so on. The company’s annual turnover amounted to 56, 227 SEKm, 61, 029 SEKm and 66, 216 SEKm in 2009, 2010 and 2011 respectively. Operating profit for the same periods were 3, 203SEKm, 8, 452 SEKm and 9, 612 SEKm. In 2007, the group demand chain of Swedtech realised that although the products the company was offering are of cutting-edge, it had to decline a lot of customer orders because of capacity constraints. Significant revenue would have been generated had factories and suppliers got sufficient capacity. In order to balance demand and supply, the group demand chain decided to implement the Sales and Operations Planning (S&OP) process to make the company demand driven.

Production is about re-presenting the future by the past

The purpose of implementing the S&OP process is to integrate the whole demand chain comprising entities such as customers, factories, product line management and suppliers. The key calculation in the S&OP process is the S&OP sales forecast, a calculation that tries to represent future customer demands. More specifically, it ought to be a market based constrained forecast for the next 36 months, but before the very calculation was initiated, actors were justifying why the S&OP process ought to be implemented. The S&OP manager illustrated,

> If you have a product that is produced in a car and sell it to industrial division, that it’s not that good communication flow. And this is the starting point of the S&OP project...because in SKF we produce, for example, a bearing which is mainly for car customers, but there is always a certain part which goes to either service division or industrial division, so it’s very seldom that one product only goes to one segment. So factories produce for different customers, SKF customer segments. That’s why it’s so important to get the whole demand right for all our customers... We had different solutions, pieces here, pieces there.

In Swedtech, there are automotive (AD), industrial (ID) and service (SD) divisions, each of which has both a sales and a manufacturing organisation. The consultants found that sales and operational planning had been working “pretty well” when sales and manufacturing are in the hand of the same organisational unit, that is, the same division. However, problems occurred when sales and productions were cross-divisional, which forms the starting point of the S&OP process, as is pointed out in the above quote. Thus implementing the S&OP process was considered as a response to two identified organisational problem, namely a lack of communication between divisions and departments and inconsistent information processing and methodology of decision making. Production in this sense is about integration that aims at realising cross divisional cooperation and consistent way of information processing and decision making.
The S&OP process was proposed as a technology that re-presents the future through past problems. The assemblage here crafts the present in-here (two existing organisational problems) and the manifest absent out-there (what it is to produce in the future). Both belong to the ontology of the Production, but as Law (2004) says, there are Others. Some of these Others were brought into presence by the S&OP manager through the following quote,

In Swedtech we produce, for example, a bearing which is mainly for car customers, but there is always a certain part which goes to either service division or industrial division, so it’s very seldom that one product only goes to one segment. So factories produce for different customers, Swedtech customer segments. That’s why it’s so important to get the whole demand right for all our customers.

The presence of the two abovementioned existing organisational problems also made present in-here two visionary boundary objects, namely the platform concept and the objective to be knowledge based. Diversity (the manifest absent out-there) in product offerings was in recent years translated into a platform concept (the present in-here) with a purpose to foster one of the company’s visions, namely to be knowledge based (the present in-here). The platform concept was used to offer combined products as a package of solutions to customers. This would require cooperation especially information integration between divisions producing different products.

As was mentioned earlier, the calculation of the technology, the S&OP sales forecast was at the inception proposed to be a pure market based forecast regardless of the company’s capacity situation for the next 36 months, but why so? What was the problem? Again the absence out-here was brought present through accounting inscriptions showing availability in-here. One of the representations is manifest as follows,

We have poor figures on more or less all channels...this is the actual situation when it comes to deliveries right now, so that is not good picture now...I just give you a hint on our availability. Here you see the H channels that we have, you see who is the planner, here we have the availability on the stock items, 81% for the H2, 9, 35, 51, 53 and so on.– by the purchasing manager of medium bearings.

Here the Production (the manifest absent out-there) is about re-presenting what it is to be produced in the future by calling past organisational problems (the present in-here) and existing visionary boundary objects (the present in-here) as well as accounting inscriptions (also the present in-here). Differences between factories and sales were Othered, for their argumentation for what to be produced were not enacted when the Production at this point of time was merely about integration.
Production is about including or excluding external customers

With regard to the S&OP sales forecast, the next step was to consider where the calculation starts with. The object of the debate is thus, which according to the group demand chain of Swedtech, the primary key of the sales forecast. There were two competing proposals. One starts with either the lower level customer item level or higher product line level, and the other starts with the general macroeconomic trend.

The first solution proposed by the group demand chain was that the sales forecast should be calculated upon either the lower customer item level, i.e. a particular bearing sold to Volkswagen, or the higher product line level, i.e. SRBs. Which level the primary key rests upon depends on for which division forecasts are calculated. In Automotive Division (AD), participants stated that the order book for customers is reliable and covers a quite long period of time, say several months, and that there are only a few big customers in this division, each of which order a large number of products. In addition, it was also pointed out that customers in AD have sound supply chain management (SCM) hence they are quite sure what their future business volume will be. The outcome of such an assemblage was that the primary key (as the manifest absence out-there) which was brought to present in-here was set on a lower customer item level. The manifest absence/presence was enacted through the relations between the order book, business characteristics and customers’ SCM. In Industrial (ID) and Service Divisions (SD), it was stated that the order book customers is almost non-existing and if it is, it covers only a very short period of time. In ID and SD, the business is also characterised by a large number of customers with each ordering a tiny little business volume from Swedtech. Customer relationship management (CRM) merely depends upon personal relationships between salespersons and customers. Therefore future customer demand is quite unpredictable. The outcome of such assemblage was that the primary key (again as the manifest absence out-there) which was brought to present in-here was set on a compromised higher product line level. Again this reality was enacted through the relations between the order book, business characteristics and CRM. Two realities of the primary key of the S&OP sales forecast were enacted. External customers (manifest absence) were made present in both realities.

There are, however, Other realities of the primary key, one of which was enacted by a business manager in the sales organisation,

The negative thing about detail bottom up forecast is of course that when you make a forecast, then...our strength in sales is that we can ask the customers about their plans, and we can get more details and more details, but of course each customer is a little bit inaccurate...They can only ask the customers saying what you think.
Customers are ‘inaccurate’ and Swedtech knows what customers ‘think’ of their future business volume. Therefore the business manager wasn’t convinced that the ‘bottom up’ S&OP sales forecast would reasonably represent the manifest absence of future customer demand if it started with external customers. Actually she thinks Swedtech would itself create a representation in-here that better reflected the manifest absent future customer demand out-there. This representation is called the business cycle forecast (BCF) which brings presence in-here the manifest absence out-there (the general macroeconomic trend). She added in one of the pilot S&OP product line management (PLP) meetings,

And normally SWEDTECH has a better understanding of what trend and future will be than some of the customers that we asked, so what is needed is to apply a certain top-down logic to say, OK, where is the general trend, can we anticipate things because customers don’t know yet. So it needs....you cannot only work one the detailed bottom up forecast because the truth is not there to be caught...

Trying to keep customers out of the enacted reality of the Production, she also explicitly mentioned,

Most of our customers even the really good ones are wrong when they give us numbers about the future. They may give us numbers about...they may be right about next week, and might be reasonably right about next month, but if you go beyond one month, the customers are completely unable to say us what exactly they need, even... so what you have to do is to decide where the market is going and the best tool we have there is the F18 curve (the business cycle forecast) because it gives you a chance to see if this is a logic continuation of the business cycle and the trend. When you have done that, you have an imagined number when you think it might be, and you look at the content and say this customer we have gained...it's a big customer, we gain market share, you add pieces of knowledge about the market that you have.

According to her, the BCF, which is a representation made inside Swedtech, should speak for the Production rather than external customers, but eventually the bottom up S&OP sales forecast was still proposed because availability problems were so high that a new calculation must be enacted.

We can see in this context there are two realities of primary key that have been enacted by different relations that assemble different ontologies of manifest absence, presence and Others. There is the reality that includes external customers, and there are even two ramified realities enacted in different divisions. There is also the reality that excludes external customers. Both representations – the S&OP sales forecast and the BCF – bring into presence in-here the manifest absence out-there (what is it to produce?) and both of them are calculated by actors inside Swedtech – either sales or the central business unit in Brussels, but what makes the difference is what manifest absence the participants of the S&OP process want to bring into presence. Is it the external customers or the general macroeconomic trend. Production is now about including or excluding external customers.
Realities are always enacted in practice (Mol, 2002). Here there exist two mutually exclusive Productions. One is enacted by the S&OP practice. The other is enacted by the business cycle forecasting practice. For the former calculation is distributed across sales. For the latter it is centralised in Brussels. External customers are included in the former but are excluded in the latter. Accounting inscriptions helped the former to speak for what it is produce only in the S&OP forecasting practice (actually it doesn’t because Production is another ontology in factories). The Production in the business cycle forecasting practice will still continue. They seem mutually exclusive but they are somewhat connected. When later the S&OP sales forecast was challenged by the factory forecast, the BCF helped sales as a reference forecast based on which their S&OP sales forecast was to be developed. Multiplicity is distributed and coordinated.

**Production is about spacing customers and products**

The S&OP sales forecast kept its fluidity in search for its new figuration in order to become an actor. After the primary keys were constructed for different divisions, it was also decided that the forecast should include two components, a computerised system forecast done by the software namely Demand Solutions and salespersons, who are called collaborators in Swedtech, market intelligence. The realities that await to be enacted were to what extent the system forecast and the collaborators’ market intelligence should contribute to the construction of the final S&OP sales forecast respectively. This was done by truncating i.e. spacing customers as manifest absences.

The basic idea underlying the distribution of calculating the sales forecasts between Demand Solutions and collaborators was that the software compares historical forecasted and actual sales in order to predict sales for the next month. This assumes all others factors in the business environment, which are actually manifest absences out-there, remain stable. The collaborators only manually modify the system forecast when she believes some of those factors will be changed more than insignificantly. Also collaborators keep an eye on those products which generate huge amount of revenue for Swedtech, but what are those products, those manifest absences? They are represented by one of the visualisations used in the company, namely the ABC analysis. The ABC analysis truncates total revenue into A, B, C, D and E items (those contribute to 30%, 30%, 20%, 15% and 5% of the total revenue respectively). Collaborators’ manual inputs should be placed upon those A, B and C items. In other words, those large customers buying a huge amount of products from Swedtech fall into the focus of collaborators. So are those popular items that have been ordered by many customers, but overall A, B and C items, though contributing to 80% of the total business turnover, only amount to 3% of total customers. This means that customers in AD will be included within the boundary of collaborators’ intelligence. This, however, does not mean all customers in ID and SD are
left to Demand Solutions, for there are other inscriptions representing different manifest absences. The S&OP manager pointed out,

The second rule is we give all those cases a certain tag, so for example, if we only have order book, but no history, which means this is a new item, we give a pre-warning, we never sold that item to any customers, for now we have the order book, so for sales man, it’s good for them to get these pre-warnings. Or you have a strongly growing item, or your order book is much bigger than your forecast, those kinds of things you can fill out of your data, we say, look, these are certain events, you should be aware of it, you should make a reviewed forecast...If I have a sales, what was the average value of it? And combine that with those filtered events, then you have a very powerful tool. ... here we have a tree which says in this case the sales per month is above certain amount of money, so it is an important item, and we filter out items that are strongly growing, of course it’s question of how do you define a growing item. We have two definitions, one is year over year, so last 12 months should be 50% above the year before, and the last quarter needs to be 100% over the quarter the year before. Here is the situation we have last 12 months, before certain period of time, it was nothing, we have according to that definition a growing record.

This means that there are other representations, presences in-here, bringing what ought to be included in collaborators’ intelligence, manifest absence out-there, into presence. Those absences include new items, items with high value and items with higher growth. What is a strongly growing item, another manifest absence, is made present via quantification. These representations including the ABC analysis are thus performative. They bring what ought to be included in the realities of computers and collaborators (manifest absences) into presence. Production is about spacing customers and products. The figure below shows how customers and products are spaced in the S&OP sales forecast. The figure also shows the fluidity of the S&OP sales forecast, for its constituents are growing.
Production is about timing customers

If allocating forecasting work between Demand Solutions and collaborators is a matter of spacing customers and products, realities enabled in computing system forecasts are effects of timing future customers.

Computing system forecasts is undertaken by the software called Demand Solutions which utilises past forecasting and actual sales. There are 21 formulas in Demand Solutions constructing 21 future customer demands, but there cannot be 21 sales forecasts. Therefore a criterion must be created in order to decide which of the 21 candidates could become the spokesperson for future customer demands. In principle, the one that is to be chosen should be the one that results in the smallest amount of error by comparing forecasting and actual sales, but selecting such a criterion, or in other words, calculating forecasting error, was not straightforward, for what could be calculated as the smallest forecast error is also a multiple. The first such smallest error is called the average or absolute error, which takes the difference between actual and forecasting sales as an absolute number. Therefore if for a certain month the actual sales is 100, and forecasting sales is 150, the average error will be 50. Actually this calculation was built in Demand Solutions and the software will choose a formula which has computed sales forecasts with smallest average errors for
the last 12 month, so in principle, the reality is calculated in singular, but in practice, there are multiple realities, as the manager of the S&OP process stated,

This is the standard from Demand Solution, you cannot change it. We ask them requesting them to give us the possibility to select according to that error or that error. Because I believe when we talk about understanding the correct level, this may be more important to have this formula and select it with the lowest mean error compared to do it having the lowest absolute error (average error)...If you looked at there, we only have a mean error of 3%, the absolutely error is 40%, it’s quite bad. You can also see the difference, this formula will come up with 112, if you select this formula, it will be 160, so it (the difference) is quite significant. That one is a very stable formula not going too much into + and -, we have one 120 and one 180. So it’s also a little but tough. It’s a small decision criterion, which formula to select, but it can have huge impacts.

This means there is another calculation of forecast error namely mean error, which is calculated as the difference between forecasting and actual sales, but the difference is not an absolute number. Using the same example, if actual sales is 100 and forecasting sales is 150, the mean error will be -50 for that month. Mean error was actually preferred in the S&OP process because sales forecasts computed using mean error as a criterion will be smoother across individual months than the one calculated using average or absolute error. Smooth forecasts were considered as consistent with S&OP’s purpose of planning medium to long-term capacity. One of the business process analyst reflected,

...if you have a strange history, we have for example for large bearings, we had a situation a couple of years ago where you can wait for 1.5 years for your orders, that means you get no supply, no sales, no sales, no sales, then suddenly there is a production, and you produce all sales in one goal, 20 large bearings in July, then there is a long period of no sales, no sales. Then of course we use that input to plan the forecast. That is not really good. So in those kind of cases, it is very valuable to adjust the history to smooth it out what was the really one.

We can now see that there are two future customers as manifest absences out-there which are enacted by the two calculations of forecasting errors (presences in-here). There is a smooth future customer demand and there is a fluctuating one. Production (what it is to produce) becomes a matter of timing future customers. As smoothing future customer demands is more in concert with S&OP’s purpose of planning medium to long-term capacity, mean error has been preferred by participants in the S&OP process, but the block is the fixation of using average error in Demand Solutions. The two manifest absences, the smooth and the fluctuating, were mutually exclusive realities, that is to say, they were Othering to each other, prior to the S&OP process, but the process now does make a difference. In order to domesticate the future that is allied with medium to long-term capacity planning, participants in the group demand chain must interact to transform mutually exclusive realities into co-existing ones. This is done by enrolling a new actor,
adjustments by forecasting managers, who can override the system forecast if she believes the computerised forecasts does not work for the S&OP process. This again shows that sometimes representations materialise not because they faithfully represent something but because they are ontological politics. These adjustments, in addition, are performative, for they enacted another reality, which is measuring forecasting accuracy in the S&OP process. One of the forecasting manager in SD said,

> We export data out of the forecasting tool (Demand Solutions), and we do it manually in excel sheets because the functionality is not really rich in Demand Solutions, so we store the forecast accuracy here.

If the criterion of average error produces system forecasts fluctuating across months, the forecasting manager can override the system by inputting her own calculation, which may be calculated using mean error as the criterion. In this sense, Production is about *timing* future customers. Mean error also does enact a new reality, measuring forecasting accuracy, which was not supposed to be part of the S&OP process. As Figure 2 shows, the fluid technology is expanding when dealing the Production multiple.

![Figure 3 Timing future customers](image)

### Production is about *timing* the product line management

The abovementioned narratives have illustrated that Production is multiple ontologically when the S&OP sales forecast is in its making. The fluid (Mol, 2000) S&OP process has enacted the Production multiple (Mol,
2002). There have also been a number of representations in enacting multiple realities, but instead of re-presenting something faithfully, they show assemblage of multiple manifest absences, presences and Others. In short, they re-present manifest absences out-there in-here as well as Other others, but Production is much more when another representation, the factory forecast, brings into presence the manifest absence of their future customer demands. Starting from this section, we will explore the ontological politics of Production when two representations – sales and factory forecasts – compete against each other is a set of pilot S&OP product line management (PLP) meetings from autumn 2010 to summer 2011.

In most debates the S&OP sales forecast was considered as unreasonable and of low quality was therefore disregarded. This means PLP management in factories did not take the sales forecast into consideration when planning what to produce. Factories have a number of reasons, one of which was the planning horizon. The discussion of planning horizon in PLP enrolled entities like product hierarchy and its related decisions. According to the manager of the product line planning stream of the S&OP,

Because if we produce the material family (MF) first then we have the order book, so customers can get what they order. So this is the next priority, and the last one is the practical distance from the safety stock. If we look at the final variant, in the normal case, we are looking at the distance from the safety stock, so this MF...they have the worse situation...if the distance from the safety stock is below certain level, we select this one. So we look at which material family has the worst situation.

Representations including order books and safety stock levels bring into presence what it is to produce next (manifest absences), but this is not uncommon in terms of operations management. What matters here is an entity called flexibility, a manifest absence brought about by a set of product hierarchy decisions. The manager of product line planning for medium bearings illustrated these decisions as follows,

We have material families. Typically, it’s the size of the bearings. If it’s one size, which means you use one type of outer ring and one type of inner ring. Then you can have different variations with different balls and different cages and a lot of different things. There is also a decision linked to that. Then you have the main variant. When you have all the material, this is the type we want to produce and when this comes to the factory, then you can turn it in different ways, you can have balls in the inner ring... you make some variations in the turning. And that is what we call the turning variant. Then we have final variants. You can have different balls and cages. You can have difference clearance, the clearance between the rings. If grinding more or less in the rings, you will have different clearances...And there are different decisions linked to this. If you look at the same...this is M decision...M lead time, D lead time and E lead time. M for main variant, no, M is material family. D is main variant. E is final variant.
According to this manager, these are called a series of sequential product hierarchy decisions. M decisions are to be made regarding which material families (MFs) to produce, followed by D decisions on how to turn the bearings. E decisions are based on which final variants to produce and will be postponed as late as possible in order to better satisfy customer orders. These product hierarchy decisions were introduced to mediate the relation between availability and flexibility. The manager in charge of the product line planning stream of S&OP explained,

So what they do is that they keep the full quantity open as long as possible for all possible variants. Then the order comes in and then we have total availability...So what they do is that they keep the full quantity open as long as possible for all possible variants...Let’s say if we have 5 days lead time on the material, and then you can take this (D) decision 15 days, and then you are closer to the actual production date, then you know more about it’s gonna be a tapered ball, that demand might have changed, or during those 5 days, you have a...you have more orders of the tapered ball, or it’s the cylindrical, so you have increased the flexibility.

Instead of deciding which final variant to produce today, the E decision is postponed so that the total volume of a MF is determined today (the M decision) and E decisions will be made when uncertainty is reduced later in the time horizon, for instance, when a customer order is received later. For Production, what is more important is that factories make these M, D and E decisions daily, as was pointed out by the product line planning manager for medium bearings,

Daily planning! I would say the objective or the goal of the daily planning, to maintain free availability. Free availability means you should have the right products on stock all the time. So we can service the market...Also the daily includes you should book the dispatch order everyday, you should order material everyday, yes, you have made your M decision what to produce, so we do this, we have a loop of tasks that we do each day...Here says core tasks for the supply chain manager, to daily or rather continuously maintain free availability, so it’s every second, it’s not reasonable, optimal free availability per product at every moment.

This shows that factories manage availability daily with the help of those product hierarchy decisions. For factories, Production is about timing product line planning. The factory forecast became the spokesperson for the S&OP process because it supports daily product line planning in factories. The S&OP sales forecast was disregarded because it concerns only medium to long-term but overlooks short-term availability planning. The factory forecast takes into account daily management of availability because product line planning in factories is characterised by making product hierarchy decisions every day.

**Production is about connecting/disconnecting incentive problems**

There was another reason why factories did not use the S&OP sales forecast. In principle, the S&OP sales forecast should be an unconstrained pure market based forecast and the factory forecast is a constrained
forecast, for factories have to take their current capacity into consideration. The unconstrained should be higher than the constrained. Commonsense! In those pilot S&OP PLP meetings, however, the sales forecast were actually lower than the factory forecast. This was not surprising to participants in the S&OP process, as was mentioned by a forecasting manager in SD,

To some extent you replicate the financial forecast which has been existing in SWEDTECH for as long as I know, and you put those numbers into here. In the financial forecast, you have certain constraints, then what we want to forecast is the unconstrained demand. I think it’s political. Local sales may not pay attention to this (S&OP) forecast because you know you will be questioned. And you might not be able to appropriately respond to those questions, or they will not be accepted. I myself have cases where we really and purely try to reflect on the demand outlook, and it was deviating compared to the financial forecast. The collaborators felt that felt that OK, since he was having two different trends, two different forecasts, he was getting a lot of unpleasant questions, which he had to respond to, so the conclusion for him was that if there are somewhat aligned, he gets a way easier.

Here too many representations of future customer demands became a problem in calculating the S&OP sales forecast. Although in practice future customer demand is a multiple, most managers believe that in theory it is an object in singular. So did the sales when calculating the S&OP sales forecast. They mistakenly thought that the S&OP sales forecast was no different from the financial forecast they had been calculating for years. This created an incentive for sales to under-forecast since the financial forecast was linked to the reward systems of sales. This means the proposed S&OP sales forecast was not calculated and that it was actually the financial forecast that was debating against the factory forecast. To sales, Production was linking to their incentives in their financial forecasting practise. The presence of financial forecasting practice, however, made the absence of S&OP forecasting practice manifest, which in in turn called for intervention to disconnect the financial forecasting practise. Therefore, to sales, what Production ought to be became a matter of disconnecting their incentives from the S&OP forecasting practice.

Production is about taming performance measurement systems
What about factories? We have described that factories did not believe that the S&OP sales forecast is reasonable and that it was the factory forecast that was carried forward in the S&OP process for product line management and supplier capacity planning. The question became why factory forecasts were taken for granted. Our study followed this question and found that it was the performance measurement system in factories that contributed to the solidity of the factory forecast. In other words, the factory forecast is a calculation pointing out what to produce after it tames the performance measurement system.

Factory channel and product line planners are evaluated based on a number of performance indicators in their Balanced Scorecard (BSC). The most important one is availability to promise (ATP) in production
channels and warehouses. To ensure availability, channel planners plan daily, and their plans are made manifest by a set of product hierarchy decisions narrated earlier. Therefore the factory forecast became a crucial calculation for those planners. It must be constructed as a trustful calculation otherwise daily availability in production channels and warehouses will be at stake. Factory forecasts were blackboxed not because they were inherently convincing but because they were placed in a network of relations between planners, the BSC and product hierarchy decisions. They tame availability in the performance measurement systems. Factories did consider the S&OP sales forecast as a technology that would improve availability, but they had been calculating such a forecast already and their calculation facilitates not only medium to long-term but also short-term even daily capacity management. In effect, they use their own forecasts as the forecasts for the S&OP process.

Things, however, became even more dramatic in a factory that produces large size bearings. One of the product line planning managers stated,

Your question was if I get blame if I get bad KPIs, that I didn’t get, I mean everybody understood you can’t get good KPIs if no order is coming etc… I had bad availability, that doesn’t tell me what to do. I had to investigate that further by doing that, I use my own KPIs, I mean that I look at the stock mix, maybe I produced something too much and that takes up stock and I’m only allowed to have certain level of stock. There can be a lot of reasons, which really don’t show up in the availability arrow. Even in theory, I could have 100% availability failures, but only one day later, because it’s very black and white, then I can have other channels having 100% errors three year wrong, I mean they would look equally bad while the three year delayed channel is a lot worse than one day channel…because it’s aggregated and it doesn’t show any details. It shows that something is wrong, not what is wrong.

The manager was actually indicating that those KPIs in the BSC were only telling the results rather than the courses of, for instance, bad availability. The BSC was too result oriented and it needed to be more process oriented, as was cogently point out by a demand chain manager for large size bearings,

Yes, KPIs. We had, um.. every month, we had results, and we compare that to the targets of that month. Then we have key activities that should support these KPIs. This is our old way of looking at it, but this becomes very much as a dashboard that… like… follow up the results month by month… here we are running three different activities that we believe we can reach 1.75 here but we are not quite sure. We are very much focusing on the result instead of the process, on the improvement process.

The presence of a result oriented BSC in this sense called for a process oriented one which used to the Othered. A new type of BSC was then initiated because of its manifest absence made by the presence of the existing BSC. The same demand chain manager said that the new BSC would initiate a change of mindset.
It’s a big mindset difference because if we only focus on the results, we could make sub-optimization, and of course we will reach this target, but maybe in that case, we can do something that will harm other KPIs. We want to see more the total picture, and focus on the activities and processes, and then the manufacturing excellence will be. The manufacturing excellence is like the Japanese, the Toyota model. We have some values and principles. So in all our decision making or improvements, we should always think out of these principles. In that way, we hopefully can avoid making sub-optimization for specific parts of the flow, for the whole processes. We look for the whole processes instead.

A visionary boundary object, manufacturing excellence, thus originated the idea of creating a new BSC. Building a set cause-and-effect relationship in this new BSC was proposed to go beyond performance measures and KPIs. Developing causal relationships to improve one KPI may cause danger that will hamper other KPIs. The factory in this case saw all the processes involving all KPIs as a collective whole.

Manufacturing excellence was enrolled to initiate the change of mindset for improving the overall processes in the factory, which was believed to have the potential to benefit all KPIs spontaneously. Also in the new BSC, some strategic challenges were made manifest if factories believe they were crucial to the overall performance. The same manager elaborated,

This is our way of working. In this we have values, we have our principles, and guidelines. And here is the vision. And in these perspectives, we have these strategic areas. So here is high motivation, this is flexible competence. This is clear leadership. This is attractive working places... And it will also affect the service in the market, availability and reliability from stable processes. So we will affect, in a positive way, the customer. Since we have increased cost efficiency and effectiveness, we will also contribute to the shareholders of increased productivity. If we have stable processes, we will have short and effective response time. If we have customers want something, we can react on that much faster if we have stable processes. So more or less, everything here reaches to that we can increase our turnover.

It was obvious the factory regarded having stable manufacturing process as a key strategic challenge in the new BSC. KPIs such as ATP and broken promises, were not only given a space in the customer perspective, but also seen as effects of a network of stable manufacturing processes that were yet to be delineated. They are therefore, no longer the leading indicators that lead to increased performance in lag indicators in a pre-determined cause-and-effect manner. Instead, it is the strategic challenges that colour those KPIs. ATP and broken promises were continued to be KPIs for which planners are responsible, but the presence of them also brought into present thereby re-presenting the degree of stable manufacturing processes.

There is, however, more about the new BSC, as the manager continued,

So this is our new... we call it strategy map from 2010 to 2015. And the bold square here is our priority. So this is what we start with during this period from 2010 to 2015 because we have limited resources. We cannot work on
everything at the same time. But if we work on the leadership and empowerment, and we work with improvement activities, we’ll get stable processes and we will affect here. Then in parallel, we have some big projects to move all our channels to this side of the river as I told you 2 days ago. That will give a high impact on reduced cost. So the bold is more like we decide to have a focus and when we communicate this strategy to all employees in the factories, we also want to communicate something that they can work with. So even we have some other things going on with big projects, this will not stop big projects but we are running it in parallel.

There is not only a causal link between strategic challenges and KPIs but also a causal link between strategic challenges and strategic activities which are priorities perceived as urgent by relevant demand chain managers. Speaking of strategic activities, the same demand chain manager said,

We have each box, for example, lower cost. We have made a description about how do we see it. It’s like a [micro]vision, just or this, we make a visualized picture of what do we want to achieve, in this text here. And then out of this text, we pick out some key words, what we need to do, for example, this is to move over the river, and why we need this KPI, and now we are in the middle of the work here, to create how we should measure the successfulness of this KPI, the moving, shall we follow it in a projected way or should we follow the specified rows in the finance report. Because to move the factory from this side to another side, it will affect a lot of rows in the financial report, the monthly report. And what should we measure on the KPI to meet a success. Maybe we should measure time, how far we have come according to plan...So this is what we are creating now. We have the strategic focuses or activities.

Surprisingly conversation with this demand chain manager found that the S&OP process was one of the strategic activities proposed in order to foster stable manufacturing process. The S&OP process should work for the BSC not the other way around. Any poor performance, for instance, low availability, cannot be attributed to any individual planner, but is considered as the effect of the overall process in the factory. The BSC, either the old or the new strategy map, therefore became an architecture that speaks for the overall performance of the factories. The S&OP forecast was regarded as a crucial actor that makes the performance measurement architecture work. Factories still used their own forecasts because the S&OP sales forecasts were not able to help them deal with strategic challenges and improve the overall performance of factories. Production in this sense is about taming the performance measurement system, for the latter is an architecture that speaks for the factory performance as a collective.

Here Production is different in sales and factories in their practicing their performance measurement. Multiples are therefore local. What they are and how they perform are dependent upon how they are contextualised in different practical settings. In sales Production is made present in here by the financial forecast not the ideal S&OP sales forecast. This Production is clearly different from the Production proposed by the group demand chain. In factory there is yet another Production which is built as part of
their BSC. Any poor performance is related to the particular factory as a whole. Production makes the factory. Production in factories was clearly questioning Production in sales by financial forecasts. Production in sales by financial forecasts was also concluded by Production in sales by the ideal S&OP sales forecast as inappropriate. The theoretical S&OP process should be the one where the S&OP sales forecast is questioned by the factory forecast and then a consensus forecast is to be agreed upon. In practice, however, this Production was not constructed although it was often brought into present in the S&OP proposals including PowerPoint slides by the group demand chain. These proposals, together with the Production by financial forecasts and the Production by factory forecasts, were actors because they later constructed the Production by the S&OP sales forecast – though not the Production by the ideal S&OP sales forecast. Production is in theory singular but in practice multiple. The competition between the Production by financial forecasts and the Production by factory forecasts is also in theory to be translated into a consensus Production by both sales and factories, but in practice there is much more.

Production is limited by capacity constraint

Participants of the S&OP process had been trying to disconnect the financial forecasting practice from the S&OP sales forecasting practice for sales since autumn 2010. Training had been provided to remind sales that the sales forecast should speak for the whole market instead of sales’ commitment. Up to February 2011, the S&OP sales forecast was increased, but factories were still not taking it into account. This time it was the capacity constraints in factories that mediated the relation between Production and the S&OP sales forecast. The manager in the ID responsible for manufacturing and supply said,

That is decided, yes. Outside 12 months, forecasts need to be unconstrained, but within 12 months, if we have considered that I cannot guarantee, the decision is that the process should be, if we have any constraints, (in) short-term we should consider it in the forecast. The ideal is that in 12 months, we should be able to fix those constraints with our own manufacturing with all possible supplies. Actually now we should have been able to see quite some product lines because they are so in shortage that for 12 months the forecast should be constrained, and then in 3 years, everything is available, just produce what they forecast.

As was narrated earlier, as factories do plan for their inventories daily, an unconstrained S&OP sales forecast does not make any sense to factories if they have capacity constraints, but building up enough capacity for the long run has been the objective of the implementing the S&OP process and been proposed as a solution to address the current availability problems, factories were given 12 months to fix those constraints so that the forecast would still be unconstrained after this period.

Production in this case is limited by capacity constraints in factories although it is supposed to be guided by an unconstrained calculation. This is another Production by the new S&OP sales forecast.
The S&OP sales forecast keeps its fluidity in the sense that the calculation is now transformed from being unconstrained for the entire 36 months horizon to the one that is constrained within the 12 months and unconstrained thereafter. The transformation was created because factories planned daily, but it also creates a new space where new activities were to be proposed to fix any capacity constraints, for instance, supporting capacity between different factories, if factories had any.

Production is about delineating a boundary for what is the customer
From May 2011 sales and factories were still trying to create a consensus forecast that could be carried forward for product line planning and supplier capacity planning. This time the object of discussion was on the boundary of what ought to be included as customers in the forecast. A product line manager from the group demand chain cogently pointed out,

More or less all factories now realize their forecasts refer to the shipment out of factories. During this period (February 2011 to May 2011), there was a huge up-stocking in regional warehouses for example Singapore and a number of factory warehouses. As a consequence, factories put sales forecast aside as they speak a different language. Sales always consider the volume sold to customers but the factories always think in terms of shipment to the warehouses or directly to customers.

‘They speak a different language’. For sales, their S&OP sales forecast speaks for external customers only whilst for factories, their calculation incorporates shipment not only to external to customers but also to other factories and warehouses. For most months the S&OP sales forecasts were lower than the factory forecasts. This was because sales forecasts didn’t take into consideration the supporting of capacity undertaken by, for instance, the Hanover factory, and shipment to local and regional warehouses.

Another actor that was performative was the lead time of transporting products between different geographical locations. The manager in charge of the PLP stream of the S&OP process explained,

In general we have four geographical areas, North America, South America, Europe and Asia. The rule is that there is no lead time between the shipping factory and the “receiver” if they are in the same geographical area. When they are in different areas, there is a 1 to 2 months lead time.

A product line manager showed me a numerical example showed below,

<table>
<thead>
<tr>
<th>Shipment Forecast</th>
<th>111 112 114 106 106 110 105 107 103 104 103 106 108 109 109</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;OP forecast</td>
<td>105 111 107 107 109 105 111 105 109 107 103 109 111 100 105 107 101 110 104 119</td>
</tr>
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Figure 4 A numerical example of LTAS8 forecasts transformed from sales forecasts
The figure shows that, for instance, if the sales forecast of the volume to external customer is 105, but considering there is a lead time of 2 months of shipment from Gothenburg to the Dalian factory warehouse, the Gothenburg factory also needs to ship 6 more today, the forecast will therefore have to be 111.

We can see a matter of *timing* and *spacing* of the boundary of what is the customer. Factories concern about external customers and internal factories and warehouses as well as the lead time of moving products between factories and warehouses located in different parts of the globe. Production is thus now about delineating the boundary of what is the customer. This ontological multiplicity again kept the fluidity of the S&OP sales forecast. The S&OP sales forecast would in the future be a lead time adjusted shipment based forecast (LTASB). This means the proposal was to adapt the boundary of the customer perceived by sales to the one perceived by factories. In this sense we can say Production is about unifying the boundaries of what is the customer of sales and factories. The Production multiple wants the Customer single. In terms of the ontology of the Production, here we have another new Production, by the LTASB.

**Discussion**

In concert with recent STS literature on exploring atherosclerosis (Mol, 2002) and alcohol liver disease (Law and Singleton, 2005), this study found that the object of what is called Production is ontologically multiple. There are many Productions. Some of them are not mutually exclusive, meaning that they themselves become constituents of an even larger Production as a wholeness. In other words, the Production is fluid because its shape is continuously changed. We have narratives claiming that Production is about representing future customers using existing visionary boundary objects, organisational problems and inscriptions, including or excluding external customers, *spacing* customers and products, *timing* customers and product line management, connecting and disconnecting incentive problems of sales, taming performance measurement architecture in factories, creating short-term capacity in order to manage long-term capacity and delineating the boundary of what is the customer. Each of the multiple involves representations that bring into presences in-here the manifest absences out-there. These presences and manifest absences also call for Others that have been routinised, insignified or repressed (Law, 2004). The calculation of business cycle forecasts were Othered because they had been routinised by a central business unit in Brussels, but the representation of future customers using primary keys that started with customers brought such an absence into a presence. The fact that factory forecasts had been shipment based was Othered because it was blackboxed. It would have remained Othered had the S&OP sales forecast not competed against its factory opponent.
Also some Productions are more or less mutually exclusive. There is the Production by the ideal S&OP sales forecast. There is the Production by the business cycle forecast. There is the Production by the financial forecast. There is the Production by the factory forecast. There is the Production by the adjusted S&OP sales forecast. There is the Production by the lead time adjusted shipment based forecast. These ontological politics of Production, however, are not prima facie mutually exclusive. They are connected by the fluid S&OP sales forecast. Like the bush bump (De Laet and Mol, 2000), the S&OP sales forecast continuously changes its shape. When production is about re-presenting future customers via existing visionary boundary objects, organisational problems and inscriptions, the S&OP sales forecast started with its figuration as an unconstrained market forecast for the next 36 months. When Production is about including and excluding external customers, the forecast had its primary key that was based on either item customer or product line level. When Production is about spacing customer and products, the forecast got its two wings, the system forecast and the manual input by collaborators, installed. When Production is about timing customers, the forecast was installed the criterion for computing the system forecast. When Production is about timing product line management, connecting and disconnecting incentive problems of sales and taming performance measurement architecture in factories, the S&OP sales forecast was continuously beaten by the factory forecast, but the defeat did increase the amount of the S&OP sales forecast. When Production is limited by capacity constraints in factories, the S&OP sales forecast transforms its minimal configuration to the one that is constrained within 12 months if factories have capacity constraints and unconstrained afterwards. When Production is about creating a boundary of what is the customer, the S&OP sales forecast modifies its minimal configuration again to a LTASB forecast. Although the Production as a multiple is local, accounting as a fluid object serves as a coordination actor trying to bring the multiple into a single, the Production by LTASB forecast. The Production by the ideal S&OP sales forecast is never made as physically present.

The group demand chain proposed the S&OP process with an ontological fixation that Production is an object in singular and that it is the same to both sales and factories, but the process of constructing the S&OP sales forecast is like a reversed chain of circulating references (Latour, 1999). Instead of multiple realities are reduced to some representations which speak for some matters of fact, the seemingly taken for granted Production single has been amplified into a multiple. It is reasonable to say that Production will be something new even if the LTASB forecast is implemented, for there will be new tensions. Latour (1999) says that every matters will be reduced to a form though there will always be gap. This study shows that representations not only reduce and amplify (Latour, 1999) but also create new realities that do not belong to the initial chain of circulation. The trajectories of these realities cannot be predicted. They drift (Quattrone, 2001) back and forth as well as up and down. Production is no longer an effect of a single chain
of circulating references. It is a multiple. That means it is enacted and manifest in multiple chains. The circulation is much thicker than what Latour (1999) states. As Law and Singleton (2005) problematised, when Latour was proposing circulating references in Pandora’s Hope, he described inscriptions as immutable mobiles. That means representations travel with stability in order to foster action at a distance, but representations are also multiples. When they travel, they also become something else. Our example of the sales and factory forecasts are typical examples. They are fluid. Same applies for availability. Availability is about loss of revenue, but it is also about inclusion of external customers as well as the effect of daily product line planning. Law and Singleton (2005) thus argued that they should be mutable mobiles. The S&OP sales forecast is such a mutable mobile. It is not only fluid itself but also creating the Production multiple. More importantly, the fluid and the multiple mutually condition each other. Because Production is a multiple, the S&OP sales forecast is a fluid, for its constituents are continuously constructed. At the same time the S&OP sales forecast also keeps Production as a multiple, for its constituents are located in multiple realities of Production. What we see here is actually a universe, multiple realities are made manifest by different constituents of the S&OP sales forecast. Production is enacted with multiple realities, but these realities are not parallel and mutually exclusive. They are connected, in different times and spaces though. This offers an interesting claim on demand chain management (DCM). DCM is about bringing integration (again a manifest absence) into presence, but this does not mean that Production is a single object, homogeneous to both sales and factories. Integration itself is also multiple, like Production. If Production is enacted multiple realities that are separated but connected by the fluid S&OP sales forecast, integration is also enacted multiple realities, the realisation of which is dependent upon how fluid technologies, including accounting, separate but still connect them. To integrate is to separate. This is not surprising if integration is regarded as multiple. It also applies to implementation of other organisational proposals. We need fluid technologies to cope with the multiples and to connect them in separate realities.

Speaking of accounting, it has been illustrated in extant literature that accounting is not only rigid thereby obstructing innovation but also flexible thereby enabling innovation. We argue that both views are problematic because they see accounting as an object in singular. Our narratives show that accounting is flexible but it is not inherently flexible. It is flexible because it is fluid, fluid enough to accommodate other objects as multiples and even to connect them in separate times and spaces. To realise this potential of accounting, organisational actors have to be aware that accounting not only represents thereby creating solutions to organisational problems. It creates matters of concern (Latour, 2005). In doing so, organisational phenomena are made multiple. This is done by enacting a set of relations between presences, manifest absences and Others. Sometimes accounting does not work. Of course it does not because organisational phenomena are multiples.
Our study has also found new insights on accounting incompleteness and its association with other local practices. In Jørgensen and Messner (2010), actors account for appropriateness of NPD practice not primarily on accounting inscriptions but also on local practice of strategising. Accounting incompleteness is not a problem, for actors are not seeking for a faithful representation of impacts of some optimal strategic objectives. Strategic objectives regarding modularisation are different objects in production, R&D and marketing thus there are ‘considerable leeway for regarding the interpretation and evaluation of NPD practices’ (p. 201). Incompleteness is blackboxed or othered because actors practise strategic objectives on their way of searching for a workable strategy on modularisation. Accounting for profitability provides a working time and space (Quattrone, 2009) where strategising becomes possible and modularisation becomes multiple. Incompleteness does not matter. In our case, accounting incompleteness is not a problem either, but it is not blackboxed or othered. In other words, it does matter. Both sales and production are keen to search for a reasonable sales forecast to faithfully represent future customer demand. As a result, there are competing accounting inscriptions. Since each inscription is incomplete, they have to talk to local actors to become the representation. They have to compete. Incompleteness attracts competing inscriptions, each of which brings presence the absence of different local practices. These practices now talk to each other in order to find which accounts for what it is to produce. Since Production is a multiple, to tame these local practices, accounting is made fluid. Incompleteness is not othered. Instead, incompleteness attracts a variety of local practices which compete for speaking for what it is to produce for future customers. It is the gathering of these practices that make accounting a fluid object. In Jørgensen and Messner (2010), accounting and other practices are substitutes which co-produce the appropriate strategic objective. In our narrative, accounting incompleteness attracts different absent local practices, which in turn make accounting fluid to account for the Production multiple. Incompleteness and local practices are actors. The accounting fluid brings together accounting inscriptions and particularity of locals. In the language of circulating references, reduction and amplification no longer go in opposite directions. They are all part of the fluid object. Accounting is always incomplete, but by calling for Others, it also enacts new organisational problems. In this sense, accounting does not work because we do not always find a single chain of circulating references. There are multiple chains and they drift. Success or failure of accounting should not be judged with regard to whether accounting does solve the problem in singular but whether accounting is fluid enough to connect separate multiples, which is made possible because accounting is incomplete.

Studies have argued that accounting representations would never fully and faithfully represent the reality because they are always incomplete, so empirically there is non-accounting expertise that triumphs over accounting expertise (Dent, 1991; Vaivio, 1999; ref.). Incomplete becomes a weakness. This is not
unreasonable because representations that produce centres of calculation with the aim of dominating the world always come with an expense of moving away from the world (Latour, 1999). There is amplification but simultaneously there is also reduction. This paper builds on this view but wants to claim that incompleteness of accounting representations is a strength because it offers a working time and space (Quattrone, 2009) where representations can move closer to the world. We call the effect of the assemblage in this working time and space word-world. Representations are incomplete because immutable mobiles are meant to be incomplete, for they are immutable i.e., stable. However, it is the presence of such immutability that triggers the call for mutability. It is exactly because accounting representations are incomplete that they are in need of modification. Competing immutable mobiles create mutable mobiles. The abovementioned studies see incompleteness as a problem and therefore what is at stake is to design alternative non-accounting technologies. What is it is an actor, an attractor more precisely.

If immutable mobiles are used for the potential of becoming mutable mobiles, then the incompleteness of accounting representations becomes an attractor, an attractor that brings into present other entities in the world. The S&OP sales forecast in Swedtech was never complete, but it was continuously brought back to the world receiving new disputes from the world. Representations foster action at a distance (Latour, 1987). This is correct but there must be much more before action at a distance. They have to be made brave enough to talk to and pass the trials imposed by the locals. The sales forecast had to pass through disagreements in factories and other business units in order to become the centre of calculation. If it is complete, it will never move close to the world. In our narrative, it becomes fluid and a mutable mobile only after it talks to the world. Reduction and amplification no longer go in opposite directions in the chain of circulating references. They are head to head with each other. There are no longer a contradictory but a complementary twin. By interacting with the world does accounting become fluid. Fluidity makes the word-world, for it is exactly because accounting is incomplete that accounting and other practices produce such fluidity.

**Conclusion**

In this paper we have taken post ANT trajectories and studied objects as multiples and fluids, but the paper aims to protect and cares for matters of concern instead of debunking matters of fact (Latour, 2004). This paper also means something about business, about what it takes to use accounting to foster integration in demand chain management as well as how accounting incompleteness interacts with other local practices.
What it is to produce, that is to say the object of Production is a multiple. It is different things across spaces, in sales and factories. It is different things across times. Some of these realities are fluid and some are somewhat mutually exclusive. Therefore the object is messy. It is inherently difficult to be managed. Any effort trying to reduce it into a singular object, exactly as what Swedtech did, will increase its multiplicity because every movement of de-finition is also a movement of de-finition, but there is possibility to organise the mess, for there are connections between the fluid managerial technology and the multiple object it acts upon. There are always Other representations that interfere and enact new realities of the object. These realities may be mutually exclusive. The managerial technology proposed to organise the object must be fluid enough so that its constituents can reach out to diverse times and spaces in order to organise the multiple mutually exclusive objects it acts upon. A fluid technology can serve as a coordinating actor to reduce the multiple into single, but future practice will make the single multiple again. There is no single chain of circulating references that makes the object a matter of fact. The fluid side of it means references drift back and forth and enact new realities also connected to the chain. The multiple side of it means there are Other chains of circulation that all belong to the object.

Accounting is flexible because it is always incomplete. There is no accounting representation that is capable of creating a Production in singular. There is the Production by the ideal S&OP sales forecast. There is the Production by the business cycle forecast. There is the Production by the financial forecast. There is the Production by the factory forecast. There is the Production by the adjusted S&OP sales forecast. There is the Production by the lead time adjusted shipment based forecast. Accounting representation is therefore creating likeness (Hacking, 2000). Likeness constructs new relations between these Productions. Likeness makes it possible that these Productions can be made coherent by some fluid coordinating technologies. Success or failure of accounting should not be judged with regard to whether accounting does solve the problem in singular but whether accounting is fluid enough to connect separate multiples.

This paper also claims that incompleteness of accounting representation is not a problem, but an attractor that makes representations move closer to the world. Accounting incompleteness attracts different absent local practices, which in turn make accounting fluid to account for the Production multiple. Incompleteness makes accounting a mutable mobile by letting it interact with the world. It produces a word-world. Reduction and amplification of circulating references go head to head. Competing immutable mobiles create mutable mobiles. Fluidity makes the word-world, for it is exactly because accounting is incomplete that accounting and other practices produce such fluidity.
Future research on accounting may offer new normative suggestions on how accounting can better *interact* with instead of *represent* daily practices. In the field of architecture, Christopher Alexander argues that there are normative ways to make architecture compositions appear more lively by leaving mundane questions to local users (Alexander, 2002). One of the principles says those architectures are made of centres and these centres should help with each other *(Ibid)*. Accounting research may use some of his repertoires, for ANT inspired accounting research has already produced theoretical constructions where accounting and other organisational phenomena are co-producing each other. We also argue that perhaps seeing accounting as a fluid object and as a maieutic machine may offer alternative frameworks to what accounting *should* be as reflected in current standard setting agenda. The claim on incompleteness in this paper is one of the actors that has the potential to construct this alternative, but more have to be done.
References


