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OPERATIONS AND SUPPLY CHAIN MANAGEMENT – THE ROLE OF ACADEMICS AND PRACTITIONERS IN THE DEVELOPMENT OF RESEARCH AND PRACTICE

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ABSTRACT

Purpose – Based on the combined experiences of Operations and Supply Chain Management (O&SCM) scholars and a reflective practitioner, the paper compares, contrasts and reconciles the competences needed to research O&SCM practice and to practice O&SCM research. The paper locates these competences for young faculty in relation to their ambitions and career choices.

Design/methodology/approach – The paper is based upon the contributions made at EurOMA 2014 Young Scholars Workshop. The theme and program of the workshop was "*Operations management – research and practice*".

Findings – The paper outlines first the concept of the Young Scholars Workshop, the evolution of themes and the specific focus of the 2014 workshop. It concludes with a reflection on the career development of O&SCM scholars, their potential role, as academics or practitioners, in the development of O&SCM theory and practice, and the role of collaborative research in that development.

Practical implications – This paper shows what it takes for O&SCM researchers to engage with "the world around us" involves and, vice versa, how "doctorate" OM and SCM practitioners may successfully solve practical problems and engage with the O&SCM world surrounding them in doing so.

Originality/value – The paper presents an integrated collection of viewpoints of O&SCM scholars and a reflective practitioner on the competences needed to research OM practice and to practice OM research.

Keywords – Research competences, EurOMA, career development

Paper type – Viewpoint

1. Introduction

As a scientific discipline, Operations and Supply Chain Management (O&SCM) continues to look for practical relevance and theoretical impact for its research. Problems and opportunities in practice are diverse and call for theoretical bases and methodologies – often from different domains and schools of thought. Operations and supply chain management, systems and practices are evident in the design, operation and performance of manufacturing firms, service providers and public organizations. While practitioners and researchers develop a discrete understanding of this evidence separately, each needs the other in the generation of a shared understanding. It is here that there is a challenge. To dichotomise, both parties work to different timescales, abstract differently and understand each other's practice differently. Each has to train and to educate others both to think and to apply that thinking systematically and even creatively to the design, running and improvement of operations.

In this context, the EurOMA 2014 Young Scholars Workshop brought O&SCM scholars and practitioners together to share their experience, views and ideas on the theme of "Operations management – research and practice". The paper first describes the Young Scholars Workshop before exploring how to increase the usefulness and relevance of O&SCM research. Then, the discussion moves to designing, conducting and publishing collaborative research before reflecting on taking theory to practice and taking practice to research. The paper concludes in bringing these reflections together, particularly in relation to the research career development of the young scholars.

2. The Young Scholars Workshop

The European Operations Management Association (EurOMA) has developed a clear strategy for the development of its members (largely academic) as contributors to the field of O&SCM. In particular, the education of its PhD students and the support of newly appointed faculty (Young Scholars) in their first academic appointments are central activities in the EurOMA agenda.

High quality doctoral research and a coherent thesis is the basis for the expectation of an original contribution to knowledge, which is key to the award of a PhD. Trafford and Leshem (2009) defined "doctorateness" in terms of a set of components comprising:

- High levels of competence in research skills: Appropriate choices on methodology, explicit research design, "correct" data collection.

- Deep discipline knowledge: A clear contribution to knowledge; a stated gap in knowledge; an explicit research question; a cogent conceptual framework.
- Competence in presentation of aural and written argument: Clear/precise presentation; full engagement with theory; cogent argument, throughout; research question answered; and conceptual conclusions offered.

In this sense, doctorateness is achieved when students can demonstrate consciously a synergy across the key components. At the doctoral level, the EIASM EDEN doctoral seminar – *Research Methodology in Operations Management* – and the EurOMA Doctoral Workshop are educational interventions, aimed both at helping the young researchers to develop their doctorateness and at sustaining the EurOMA network. The EDEN Seminar introduces O&SCM students to good practice in research design, specifically in the context of the development and completion of the PhD thesis. In addition, the EDEN Seminar introduces them as students to each other. In the year following participation in the EDEN Seminar, many participate in the EurOMA Doctoral Workshop, run as part of the annual EurOMA conference. Some students may participate in the Workshop in two successive years, so developing capability and confidence in the presentation of their research to an audience of peers. At the end of this cycle of engagement, students may participate in the full EurOMA conference programme, presenting a paper for which they may be sole or joint authors.

On completion of their doctoral studies, some students are appointed into faculty positions. Many will not have had prior experience of teaching or of managing a career trajectory based upon research, publication and teaching. At an institutional level, they may receive support in this area. In a complementary way, the EurOMA Young Scholars Workshop (YSW) provides a unique discipline-based opportunity for the young faculty to locate their ambitions within a group of discipline peers and to develop a sense of the choices they might face. Many of the participants in the YSW will have engaged as doctoral students in the EDEN Seminar, the Doctoral Workshop and in the full EurOMA conference programme. Run for the first time in 2009, the focus of the YSW has evolved and, now, explores various themes:

- Supervising MSc and PhD students.
- Teaching OM to MSC and MBA students.
- Designing and developing research projects in OM - from concept to publication.
- Career development - managing your way through academia.

- Operations management - research and practice

The 6th EurOMA Young Scholars Workshop, which took place in Palermo, Italy on Sunday 22 June 2014, brought together O&SCM research-active scholars and practitioners to share their experience, views and ideas on the last theme. Specific questions and topics addressed were:

- How do we, as O&SCM scholars, increase the accessibility of our research?
- How do we increase the usefulness and usability of O&SCM research?

The seminar was led by Harry Boer (Professor, Aalborg University) while Paul Coughlan (Professor, Trinity College Dublin), Domien Draaijer (Manager, Quality & Business Partnership, NXP Semiconductors) and Janet Godsell (Professor, University of Warwick) who contributed their perspectives on O&SCM research and practice. Each contributor had a slot of one hour. This paper is based upon those contributions and the resulting discussions with the young scholars attending the workshop.

The careers of the contributors span the domains of research and practice. After an early career in engineering management, Paul Coughlan became a university lecturer, then a full-time doctoral student, and, eventually a professor in Operations Management at Trinity College Dublin. Domien Draaijer obtained a PhD in Operations Management and, after a spell as a university lecturer, he moved to industry. Currently, he holds a senior management position at NXP Semiconductors in the Netherlands. Janet Godsell held senior management positions in Supply Chain and Operations Management before she returned to academia to complete an EMBA followed by a PhD. Janet is a professor of Operations and Supply Chain Strategy at Warwick University. The three presenters are educated O&SCM scholars and, although their career paths and research and managerial experiences differ significantly, the two professors continue their engagement with practice, while the practitioner continues his engagement with theory and research. This combination provides a rich source for deep insight into the interaction between theory, research and practice.

3. How to increase the usefulness and relevance of O&SCM research?

Wickham Skinner is regarded as one of the founding fathers of modern operations management thinking. In his seminal Harvard Business Review (HBR) article, Skinner (1969) was the first to make the link between corporate and manufacturing strategy. Skinner based these observations on his employment over a decade with Honeywell. He was driven

by a desire to improve the practice of OM by solving the problems that he witnessed first-hand. Over 40 years later, in his 2010 keynote address at the Decision Science conference, Skinner expressed concerns that OM was losing its industrial relevance, as academics focused on publication ("taking from the system") and not solving the big problems of today. To quote Skinner (2010):

> *"We need to move away from a culture of extraction (taking from the system) and concentrate on building things and leave a legacy… We need to focus on improving methodology and apply it to solving the 'big' problems of today".*

This sentiment was echoed by Narasinham (2010) during a panel at the same conference when he posed the questions:

> *"What are the questions that O&SCM are asking today?*
> *How is value added?"*

and suggested that:

> *"A focus on the cycle of conceptual theory building (perception, evaluation, elaboration, extrapolation, positing) will help us to address these challenges".*

The concerns of Skinner and Narasinham cut to the core of scholarship in O&SCM. Scholarship in O&SCM is a holistic and integrative process based on insights and perceptions gained from a scholar's consultancy, application, teaching and research activities (Mentzer, 2008). Scholarship cannot be achieved in isolation and it draws on the inputs from students, practitioners and other academics. It is driven not only by knowledge of the extant literature but also through observation of O&SCM phenomena evident in the world of practice.

3.1 A changing landscape and some tough choices

The last decade has seen the narrowing of the performance criteria used to assess academic excellence. The overwhelming order-qualifying criterion for promotion is academic publication in the highest-ranking journals. Here, young faculty who have graduated from US or European doctoral education programmes are more or less prepared.

The US dominates the academic job market, the O&SCM journals and the type of research that the journals publish. This system has a bias towards more quantitative research methods, in preparation for which the US doctoral education is founded on more formal research

methods training. Doctoral students are required to attend and to pass a variety of courses, typically over a period of two years, before they can begin the thesis research. Students have the strong advocacy of their supervisor and a focus on outputs in the form of academic publication from the outset.

In contrast, doctoral programmes in Europe (from which the majority of EurOMA young scholars have graduated) are more eclectic in their design. Whilst some programmes have more formalised approaches to methods training, others place more value on developing the required skills through the research process itself. Historically there has been less of an emphasis on academic publication until after completion of the doctoral thesis, and more on self-development and scholarship.

So, today's young O&SCM scholars face some tough choices. Whilst there are some efforts to redress any perceived imbalance through considering the impact (relevance) of research in addition to its quality (rigour), these efforts are largely European and have yet to gain traction. Fundamentally, the track to tenure is more closely linked to academic publication than ever. While the rankings of journals vary from country to country, it is not possible to become a professor in some European business schools without publication in a world elite academic journal. Such journals publish rigorous but not necessarily practically relevant research. So, a young scholar is faced with a difficult choice in primary motivation – pursue academic publications or do research that is relevant to practice – with significant career implications.

3.2 Journal personality

The route to publication in the higher-ranking journals is not necessarily an easy one. As illustrated in Table 1, there is an inherent research bias in the journals, with analytical methods accounting for over 70% of research in O&SCM[1].

[1] This analysis is based on an evaluation of the papers published in the seven O&SCM journals identified by Wacker (1998) over a 5 year period from 2004-2008. They include Decision Sciences (DS), Harvard Business Review (HBR), International Journal of Operations and Production Management (IJOPM), International Journal of Production Research (IJPR), Journal of Operations Management (JOM), Management Science (MS) and Production and Operations Management (POM).

INSERT TABLE 1 ABOUT HERE

If a young scholar wishes to maximise the chances of publication then it could be argued that he/she should conduct research using analytical mathematical methods; papers using these methods are accepted in all of the identified journals except HBR and account for almost 50% of all publications (see Tables 1 and 2). Whilst accounting for a significantly smaller proportion of papers, empirical statistical papers are also broadly accepted.

If a young scholar wishes to target a particular journal then it is important to understand the "personality" or profile of research methods that the journal favours. For instance, IJOPM favours empirical papers of a statistical (38.9%) or case based (24.8%) nature whilst also supporting analytical mathematical (21.5%) papers. JOM has a preference for empirical statistical (34%) and analytical mathematical (28.1%) and conceptual papers (12.3%). In contrast IJPR has a strong preference for analytical mathematical (61.6%) and analytical conceptual papers (22.3%).

INSERT TABLE 2 ABOUT HERE

Whilst Table 2 is not a definitive list of O&SCM journals, it highlights an added dimension to the young scholar's publication dilemma:

> *"Do I pursue publication in particular journals and design my research to increase chances of publication?"*

or

> *"Do I conduct research that addresses specific O&SCM issues, problems, challenges and then look for the most appropriate outlet for publication based on the findings?"*

As noted earlier, individual motivations differ and some young faculty may wish to pursue tenure, and hence publication, at the expense of relevance. For the young scholar wishing to achieve both relevance and rigour this could be a tough challenge, as the promotion system seems to favour publication rather than problem-driven research.

A potential solution is suggested by Skinner's (2010) call for "improved methodology" and Narasinham's (2010) focus on "conceptual theory building". It requires us to look at scholarship in O&SCM for what it really is, a form of management research.

3.3 O&SCM: A type of management research

Management research is distinguished from other forms of research by its embeddedness in the complexity of the practical world of organizations and people. The tension between disciplinary and trans-disciplinary approaches (Tranfield and Starkey, 1998) is at the core of the academic community's desire for peer acceptance and the management's for relevance. What distinguishes management research from other forms is the realisation that the act, science and art of management constitute a combination of theory and practice. Managers not only feel that research needs a practical outcome, they are often able to take action themselves based on the outcome of their inquiries. Furthermore they are unlikely to support research activities unless there is a perceived benefit to their organization (Easterby-Smith et al., 1991).

Until the early 1990s, knowledge production was largely driven by academic agendas and the results stored in disciplinary silos (e.g. OM). Gibbons et al. (1994) were the first to suggest an alternative to this traditional or mode-1 approach, which they termed mode-2. In mode-1 there is a clear distinction between the theoretical core and application. In contrast, mode-2 is characterised by:

> *"... a constant flow back and forth between the fundamental and the practical. Typically, discovery occurs in contexts where knowledge is developed for, and put to, use, while results – which would have traditionally characterised as applied – fuel further theoretical advances"* (Gibbons et al., 1994, p. 19).

Since then there has been broad acceptance of the mode-2 approach by both the European and British Management Journals (e.g. Tranfield and Starkey, 1998; Tranfield, 2002).

Van Aken (2001a, 2001b, 2001c) suggests an alternative to the established formal and explanatory sciences – design science, as summarised in Table 3.

INSERT TABLE 3 ABOUT HERE

The key question that design science seeks to address is "how should things be?" and, in so doing, to solve problems or to improve the performance of existing entities. To quote van Aken (2004, p. 241):

> *"Research in management theory is aimed at developing sound technological rules*

> *and at uncovering the generative mechanisms that link (immaterial) intervention with (material) outcomes … such generative mechanisms can be of a material nature, but are mostly of an immaterial, sense-making nature".*

In brief, generative mechanisms are a key aspect of critical realism. Bhaskar (1978), the father of critical realism, believed that there was a difference between a causal law and a pattern of events. Like the layers of an onion, critical realism is based on different layers of reality, which can be revealed through the systematic application of science (Chia, 2002). Bhaskar (1978) defined three layers or domains; the empirical, the actual and the real. The empirical is made up of experience and events through observation; the actual includes events whether observed or not; and the real consists of the processes or mechanisms that generate these events. Thus, as summarised by Blaikie (1993, p. 98):

> *"Realist epistemology is based on building models of such mechanisms such that, if they were to exist and act in the postulated way, they would account for the phenomenon being examined. These models constitute hypothetical descriptions which it is hoped will reveal the underlying mechanisms of reality; these can only be known by constructing ideas about them".*

The view of management research then as a design science is aligned to the critical realist epistemology. In an O&SCM context it seeks to solve problems or to make improvements by understanding the underlying rules or mechanisms, whether these are directly observable or not. In doing so it enables O&SCM scholars to conduct research that is not only relevant (as it is directly aimed at solving the O&SCM problems that managers face currently), but also rigorous (in the way that it supports a conceptual theory building cycle). This suggests a shift in paradigm when designing problem-centred O&SCM research from the positivistic logics of induction and deduction, to the realist logics of abduction and retroduction.

As illustrated in Table 4, the realist logics seek to build an account of how the underlying or generative mechanisms work in a given context (abduction) and then extend into a broader socio-economic context (retroduction).

INSERT TABLE 4 ABOUT HERE

As illustrated in Figure 1, the abductive research process emphasises the search for theories suited to an empirical observation (Kovács and Spens, 2005) or "theory matching" (Dubois

and Gadde, 2002). It is differentiated from inductive or deductive research by its creativity (Taylor et al., 2002) and ability to offer new insights about the event or phenomenon (Kovács and Spens, 2005). It is iterative in nature. It starts from the assumption that existing theory or concepts cannot fully explain a phenomenon but can act as a vehicle for empirical exploration (Dubois and Gadde, 2002). The theoretical framework (not able to fully explain the empirical observations) is then newly matched or extended to provide a rational explanation for the observations (Andreewsky and Bourcier, 2000).

INSERT FIGURE 1 ABOUT HERE

In this way new theory can be conceptualised to tackle the real-life problems faced by O&SCM in practice and thus ensuring the relevance and usefulness of the research. Given the more exploratory nature of the research, and its involvement in the conceptualisation and building stages of the theory building cycle (Meredith, 1993; Handfield and Melnyk, 1998; Christensen, 2006; Van der Ven, 2007) it is important that more exploratory research methods are utilised to ensure methodological fit (Edmondson and McManus, 2007). With solid roots in the theory development cycle, it should also provide a sound justification for the publication of more exploratory research methods in world elite and internationally recognised journals.

The relevance and usefulness of O&SCM research can be improved by recognising that it is a form of management research and cannot be separated from the complex context in which it resides. For it to have relevance to management it must address the problems that they face in practice. By viewing O&SCM research as a design science, underpinned by the realist logics it is possible for young scholars to be effective and by "doing the right things" but also to be efficient and rigorous by "doing things right" (after Drucker, 1974). In that way they can both push forward the bounds of O&SCM knowledge and achieve tenure.

4. Designing, conducting and publishing collaborative research

Useful and relevant O&SCM research is often collaborative. Young scholars have choices as they design, conduct and publish their collaborative research. For many, publishing from a recently defended dissertation may be on an immediate horizon filling up with new teaching assignments and research proposal development. It is in the development of new research proposals that a major choice emerges. Should the young scholar plan to research alone, with other researchers only, with practitioners only or with both researchers and practitioners?

This last option opens the possibility of collaborative management research.

4.1 Collaborative management research

Collaborative management research is defined as (Shani et al., 2008, p. 616):

> *"Collaboration between scholars and practitioners to yield knowledge to inform practice and the theoretical understandings that pertain to the academic field of management and organization studies".*

Collaborative management research attempts to refine the relationship between academic researchers and organizational actors from research on or for to research with. In doing so, it attempts to integrate knowledge creation with problem solving and "inquiry from the inside" with "inquiry from the outside". It is constructed typically out of practitioner perceptions of key issues and out of key issues that emerge out of the themes when issues are analysed. As such, collaborative management research is viewed as a true partnership among a variety of individuals forming a community of inquiry within communities of practice, encompassing the dynamics and equality of integrated collaboration, emergent and systematic inquiry through systematic and reflective inquiry, and actionable scientific knowledge (Coghlan and Coughlan, 2008). Implementing collaborative management research raises some actions for the researcher: finding a problem; finding a group; identifying their questions, reflections, and insights; how to build their (and the researcher's) commitments; and, helping them while being open to their help.

4.2 An Illustrative programme of research

To illustrate the opportunity and challenge of collaborative research, the 2014 YSW cohort reflected upon a set of four related funded research projects carried out by one of the YSW contributors over a period of 17 years and summarised in Table 5. The insights from this research have fed into a range of publications.

INSERT TABLE 5 ABOUT HERE

Common across each project has been a concern for operations improvement at firm and network levels from both substantive and methodological perspectives. Throughout, the research questions and their inter-linkages have evolved. Many substantive themes have evolved in this research including operations improvement, organizational learning,

collaboration, collaborative strategic improvement, and network action learning.

The action learning and action research approaches employed have become more systematic as many methodological themes have evolved including collaborative management research, action learning and action research in collaborative improvement, collaborative research, inter-organizational action learning and action researcher networks. This collection of projects has engaged researchers from different domains and practitioners from different industries. Collaborators in this research have included researchers and doctoral students in the domains of operations management, engineering, organization development, food science, geography and environmental science. On the practitioner side, collaborators have included food producers, water companies, aero industry firms, auto industry firms and service providers.

Coghlan and Coughlan (2008) identified three particular insights on collaborative research from their experience of designing, conducting and publishing their collaborative research outlined in Table 5:

- Linking theory, practice and collaboration
  - Collaborative management research in and by an inter-organizational network has the potential to generate actionable knowledge.
  - The challenge is not just to engage in the action, but also to maintain the interest and patience of the researchers to contribute to knowledge
- Capturing difference while sustaining the collaboration
  - For managers to act as researchers, it requires that they develop confidence in a new language and process – that of research – in order to translate their access and experience into actionable knowledge.
  - For the academics to engage in collaborative research with the managers and with the other researchers, requires that they develop a confidence in the new languages not just of the individual company settings, but also of the network, in order to make best use of the privileged access granted.
- Managing quality
  - The research topic must be a real life issue relevant to both practitioners and academics and of practical and theoretical value.
  - The collaborative process must engage the academics/practitioners, in social interaction that is genuinely participative and collaborative and that

acknowledges, builds on and actualizes the perspectives, interests and strengths of each.

- The process must be reflective – the community of inquiry engages in cycles of action and reflection, supported by rigorous data gathering methods, collaborative analysis and joint meaning construction and agreed action as the project is conceived, enacted and evaluated.
- The outcomes must be workable, sustainable and encourage further scientific experimentation; the theory must be actionable, transportable and adaptable to other settings.

4.3 Designing, conducting and publishing collaborative research

Collaborative research requires researchers to be design thinkers, to overcome fears that inhibit their creativity, and to build their creative confidence. "*Contrary to popular opinion, you don't need weird shoes or a black turtleneck to be a design thinker*" (Brown, 2008). Rather, characteristics including empathy, integrative thinking, optimism, experimentalism and collaboration are essential in the researcher or those with whom the researcher might collaborate. The creativity required is something the researcher can practice; it is not just a talent they are born with. As Kelley and Kelley (2012) advise: do not be stopped by fears of the messy unknown, of being judged, of the first step or of losing control. Rather, to build creative confidence, as Kelley and Kelley (2012) advise, researchers need to have the courage to try out their new ideas and, like IDEO (the design and innovation consulting firm), fail often to succeed sooner. They need to develop humility, to let go of ideas that don't work and to accept good ideas from other people. Finally, they need to break the challenges of designing, conducting and publishing collaborative research down into small steps and then to build confidence patiently by succeeding.

So, as a collaborative management researcher, there is a need for the researcher to pay attention to how her/his own thinking and research practice evolves. For example, the researcher might draw parallels (and differences) with Kaplan's (1998) innovation action research cycle where he reflected on his collaborative development of activity-based costing and of applying the balanced scorecard over a period of 15 years. The resulting cycle, in **Error! Reference source not found.** represents the researcher's attempt to formalise a theory of a mode of knowledge creation.

INSERT FIGURE 2 ABOUT HERE

In a related way, the researcher might draw upon Torbert's (1998, 2001) framework of first, second and third person research in her/his approach to consolidating the research (Sherman and Torbert, 2000; Reason and Bradbury, 2001; Coghlan and Coughlan, 2002; Coghlan and Brydon-Miller, 2014). Here the first person voice is that of the collaborative researchers who inquire into their own actions, giving conscious attention to their intentions, strategies and behaviour and the effects of their action on themselves and their situation as they design, conduct and publish their collaborative research. The second person voice integrates the voices of the participating managers in the collaborative research as articulated in review meetings, reports, conference presentations, case studies and ongoing reflection and evaluation. The third person voice extrapolates to the academic and practitioner communities what has been learned from the collaborative research and how any other such collaborative programme might work as articulated in presentations, papers and proposals for other research. This perspective invites researchers to treat their collaborators as "fellow-travellers" in an evolutionary process and to think in terms of a research programme as linkages emerge among the collaborative research projects.

5. Taking theory to practice – taking practice to research

Up to this point in the paper, the proposition is that young scholars may be given choices and take the opportunity to develop an academic career where they teach and research in O&SCM, possibly as collaborative researchers. Alternatively, they may opt for an industrial career and take all of their knowledge and skills to industry. This part of the paper focuses on the latter option, and exemplifies the dynamic interplay between theory, research and practice. The discussion is organized around four cases in which one of the YSW contributors has been involved over the past twenty years. The cases are summarised in Table 6 and the interplay is illustrated in Figure 3. Except for case 1, the cases are set in the electronics or, more specifically, the semiconductor industry.

INSERT TABLE 6 ABOUT HERE

INSERT FIGURE 3 ABOUT HERE

Before going into the cases individually, some general remarks help to describe the purposes of, and the interaction between, practice, theory and research. Practice involves running a business so that commercial goals are achieved, needs of the environment are met and

continuity is secured. The purpose of theory is to provide a language or models that allow for transferable insight into "how things work", and to provide insight into causes and effects. Research serves to link practice and theory in order to validate existing theory and to stimulate the further development of theory.

In terms of the types of research addressed in Sections 3 and 4, the cases described in this section can be classified as depicted in Table 7.

INSERT TABLE 7 ABOUT HERE

5.1 Case summaries

Case 1 was a research project aimed at developing transferable insight into the optimal conditions for the formulation and implementation of a successful manufacturing strategy (Draaijer and Boer, 1995). This case required studying the relationships between the design and performance of manufacturing systems. Based on 25 case studies of manufacturing plants, the project delivered a more complete and consistent operationalization of manufacturing system performance and a validation of the relationships between product, process and control complexity. Practically, the research contributed to the development of a framework to assess manufacturing systems and to help companies check the consistency of their manufacturing strategy. The framework helps to identify the optimal fit between the design characteristics of a manufacturing system and its desired performance profile. Different choices can be made on, for example, the product design, the maturity level of the applied quality practices, lay-out decisions, good flow control principles, departmental design principles, maintenance principles. By means of a morphological overview, these design characteristics become readily visible. For the performance profile, parameters related to cost, product and process quality, lead-time and flexibility (introduction, mix and changeover flexibility) are defined and operationalized. In addition, an assessment tool was developed, which enables checking the consistency between the intended improvement activities and the desired improvements in the performance profile.

Case 2 concerned a benchmarking project set up by the semi-conductor industry to learn from each other and to formulate projects that needed the involvement of more than one company. Information was collected and benchmarks were made among the participating companies on, amongst others, technologies used and operational ways of working. The insights developed

were shared via participants, research projects, survey reports and books, and applied all the way from technology and industrial strategy to operational practices. The project allowed participating companies to compare themselves on multiple dimensions with other companies in the same industry. The frameworks developed to describe in a uniform way the different companies, collecting the relevant data and analysing them was strongly influenced by the competences and insights acquired in case 1.

Case 3 focused on the development of an industrial base for mobile phone components. The booming mobile phone market needed components – for example, power amplifier modules. The industrial base was defined in 1998 and implemented in a period of six years, including four wafer-fabrication and four assembly sites (located in Europe, North America and Asia), and 20 component suppliers. When other technologies took over, the industrial base was restructured. The mobile phone market needs high performance semiconductors with a high functionality on a very small footprint (size). The processes to produce these semiconductors require more steps resulting in longer lead times compared to less advanced processes. The mobile phone market needs very short times to market and volume. To cope with the non-optimal fit between lead-time and time to market a very smart Concurrent Engineering system is needed to parallelize technology development, product development and industrialization as much as possible and synchronize the maturity levels of these three processes. Making all the interdependencies insightful and "formalizing" this in the way of working (milestones) made the well-known concept of Concurrent Engineering real life.

Finally, case 4 concerned the implementation of "an automotive mind-set" in a semiconductor wafer-fabrication plant and was based on the belief that certain behavioural values – amongst others "raising the bar" and "developing deep core competences" – must be exercised in order to become and remain successful in industry. The automotive industry places very strong quality demands (0-defects, no customer complaints) on its suppliers. Over time these requirements become more severe. The degree to which a supplier meets these requirements also determines the share of supply it gets. So, in order to stay a reliable supplier, continuous improvement is a must. In order to meet these requirements it is utterly important that employees at the supplier are aware of these requirements and have skills to improve continuously. Relying heavily on the three preceding case studies, a training program was developed and taught in the form of class sessions and assignments in which all staff and key suppliers took part. Core elements included customer requirements, quality tools and behavioural values. The training was repeated after a year and a half. Every new

training wave includes new elements that are suited to the growing maturity level of the organization and the new challenges ahead.

5.2 Reflections

Various lessons can be drawn from these four case studies. First, theory, research and practice support and enhance each other. Deliberately and consciously using O&SCM theory and research in O&SCM practice enhances further development of skills and expertise, especially if new, boundary-changing practices are adopted, developed and implemented in an ongoing business, where change may not have a clear start or end. In this context, O&SCM in practice goes far beyond textbook or journal knowledge. O&SCM textbooks provide generic insight while O&SCM journal articles usually provide specific, narrow and hardly actionable insight. In contrast, problems in O&SCM practice are company, or situation, specific and usually complex. Designing, implementing and managing complex solutions that fit the context in which they are applied become critical skills which help a trained O&SCM scholar to become an O&SCM professional and to enjoy her/his role in practice.

If practice is related back to doing doctoral research, some important lessons appear to be part of being a researcher. Doing a PhD study is a long, three years or more, process. “Surviving” that process teaches one not to panic easily – problems and setbacks are bound to occur but, as a doctoral student, one learns to overcome such challenges. Writing and conceptualization skills are developed, which are important during the PhD study and remain important in professional life. Identifying and tapping into multiple sources help to formulate and to bring forward ground-breaking ideas while developing the capacity to see, find and explore critical issues.

However, while O&SCM doctoral research can be an individual activity, O&SCM practice is not. Identifying and analysing problems, looking for, adopting/adapting and/or developing the complex situational solutions referred to above, and implementing them successfully, is hard work. It may last several years and involve a variety of people with specific roles and particular competences to achieve the planned outcome.

So, on reflection, what can an O&SCM scholar who moved to industry learn from spending 20+ years in practice? First, that insight has a life cycle, as sketched in **Error! Reference source not found.**4. Note that, in practice, steps in Figure 4 may be skipped or may take

place in a different sequence to that illustrated. For example, applying insight may involve exploring an existing insight, which generates a new, and replaces the existing, insight.

INSERT FIGURE 4 ABOUT HERE

Second, in addition to (not instead of) the "doctorateness" – research skills, discipline knowledge, presentation (Trafford and Leshem, 2009) developed during the PhD study, practice requires professionalism in areas such as:

- People skills, including, listening to, motivating and convincing people.
- Collaborative skills: real-life O&SCM problems are usually complex and require the involvement of various areas of competence, i.e. people (managers, consultants, the workforce) representing these competences.
- Design and implementation/change management skills.

6. Consolidation

6.1 Implications for theory, research and practice

The interplay between O&SCM theory, research and practice is ongoing and, by nature, dynamic. Practice develops, research investigates and may even produce new practices, theory describes and explains the mechanisms with which new and existing practices interact and affect performance, mimicking the innovation action research cycle in O&SCM illustrated earlier. However, the role that each of these concepts plays differs between scholars and practitioners.

O&SCM researchers take their starting point in theory, usually research practice, and aim at developing new theory, or testing or generalizing existing theory. The research design choices they make and logics they choose depend a great deal upon the problem they tackle, and by the scope of their ambition to be both relevant and rigorous. So, for example, addressing a gap in theory requires explorative approaches (e.g. case studies, action research), while theory testing requires explanatory approaches (e.g. survey studies). Ultimately, they must publish to disseminate and also to progress in their careers. It is here that they need to navigate the academic promotion system and demonstrate the impact of the research upon the kind of problem tackled.

O&SCM practitioners take their starting point in practice, may use theory, and aim at developing practice. Their approaches may range from rigorous project management through

design thinking (e.g. Brown, 2008) to visionary experimentation. In a recent article (Boer et al. 2015), Roger Schmenner refers to five major breakthroughs in OM which were the result of vision and experimentation: division of labour, the factory, the development of the moving assembly line, combatting the bullwhip effect, and just-in-time manufacturing. The Volvo experiments described in Karlsson (1996) could be added to this list.

Yet, these are not separated worlds: research and practice meet in collaborative research as addressed in this paper. A question emerging from this collaboration is: what can researchers learn from practitioners, and what can practitioners learn from researchers? The key is in Schön's (1983) notions of reflection-in-action and reflection-on-action. Reflection-in-action has been described as "thinking on our feet", and roughly involves acting and learning in the unfolding situation at hand. Reflecting-on-action involves thinking about what has happened and might be done differently a next time. In collaborative research, practitioners can help researchers to understand the intricacies and complexities of practical problems better and show them how they act upon events unfolding in the research. Expressed differently, the practitioner voice is added to the first person voice described above: practitioners can be collaborative researchers who inquire into their own actions, giving conscious attention to their intentions, strategies and behaviour and the effects of their action on themselves and their situation. The academic researchers, in turn, can help practitioners to explicate their reflective learning and to understand the effects of their actions. In essence this adds to the second person voice noted earlier in this paper.

As noted above, O&SCM is a form of management research. However, according to many scholars, O&SCM as a scientific discipline does not draw on management theory (Chase, 1980). Furthermore, the discipline is relatively fragmented (Slack et al., 2004), and does not have a recognized theory (Schmenner and Swink, 1998). Several authors (e.g. Slack et al., 2004; Pilkington and Fitzgerald, 2006; Fisher, 2007; DeHoratius and Rabinovich, 2011) advocate strengthening the empirical base, relevance and validation of O&SCM [2]. Boer et al. (2015) go as far as to suggest that, yes, theory is fundamental to O&SCM research but not the inevitable starting point. They quote Van Wassenhove (in Schmenner et al., 2009), who wrote "*... why make up problems when the world around us is full of fascinating and crucially important problems that beg for some elementary insights? ... We need answers to pressing problems, not more theories or methodological scrutiny. The field is called OM, not*

[2] The authors referred to consider OM only, but the issues they address hold for SCM, too.

mathematics". This paper shows what it takes for O&SCM researchers to engage with "the world around us" and, vice versa, how "doctorate" OM and SCM practitioners may successfully solve practical problems and engage with the O&SCM world surrounding them in doing so.

Evolving around the central challenge of taking theory to practice – taking practice to research, the 2014 EurOMA Young Scholars Workshop provided an opportunity to address several pressing problems facing young (and not so young) scholars:

- How do we, as O&SCM scholars, increase the accessibility of our research?
- How do we increase the usefulness and usability of O&SCM research?

Important directions proposed in this paper to address these issues are:

- Recognize that O&SCM research is a form of management research, which cannot be separated from the complex context in which it resides.
- View O&SCM as a design science, which, underpinned by the realist logics, enables young scholars to be effective by "doing the right things" but also to be efficient and rigorous by "doing things right".

6.2 Career implications

If they stay in academia, young scholars may pursue different career trajectories, including research-predominant or teaching-plus-research (LSE, 2011). However, even in the most research-intensive institutions some academic staff will be more "research-active" than others, and some will be more teaching-orientated, while in mainly teaching-based departments, a lot of good research can be undertaken. Correspondingly, there is a widely used distinction between "basic" research and "applied" research, with an intermediate category of "user-inspired basic research" (LSE, 2011). Applied research is directly driven by a concern to answer users' problems and to improve existing in-use technologies or social arrangements. As noted earlier, many researchers have found that there are weak incentives inside universities to undertake applied rather than basic research. While many O&SCM researchers may still find weak incentives, the emerging importance of business school accreditation may re-balance the incentives. For example, AACSB accreditation demands evidence of continuous quality improvement in three vital areas: innovation, impact, and engagement (AACSB, 2013). The underlying AACSB proposition is that *"...quality business*

education cannot be achieved when either academic or professional engagement is absent, or when they do not intersect in meaningful ways" (AACSB, 2013. p. 3).

For young scholars pursuing an academic career and, for that matter the entire O&SCM discipline, bridging the gap between theory and practice so as to achieve the ambition of "doing the right things right", is becoming increasingly important (e.g. Slack et al., 2004; Schmenner et al., 2009; Boer et al., 2015). Building on the skills they developed during their PhD studies, young doctors leaving academia and going to (industrial) practice need to manage "the lifecycle of insight" and develop the professionalism (people skills, collaborative skills, design and implementation/change management skills) needed to become a successful O&SCM practitioner.

6.3 Collaborative research –bridging theory and practice

Collaborative research has been shown to be a powerful methodology to support both career paths. Access is critical for any collaborative research initiatives. Two types of access are relevant: primary and secondary. Primary access refers to the ability to get into the operation and to contract to undertake research. Secondary access involves entering specific areas within the operation or specific levels of information and activity (Coughlan and Coghlan, 2009; Coghlan and Brannick, 2014).

There is a growing incidence of research being done from within organizations by insiders, e.g. practicing O&SCM managers who undertake action research projects in and on their own organizations. The insider role is common in the context of managers participating in academic programmes (Coghlan and Brannick, 2014). As an insider, the manager takes on the role of researcher in addition to her/his regular organizational role and may both manage the project and research into it at the same time. Here, as seen in the four cases earlier, the O&SCM practitioner, may find access, both primary and secondary, easier: her/his subordinates and colleagues may buy-in to the project while the practitioner-insider is likely to have a personal stake in the outcome of the project.

For the O&SCM scholar, access may come through the university or an invitation from the organization. There is evidence of academics taking the lead and creating industrial collaborator forums, think tanks, and research observatories to bring together end-user organizations, software providers, data analysts, logistical service providers and consultants to explore, in an inter-disciplinary and "inside-out", "outside-in" way, complex O&SCM

challenges. These types of activity can then act as key informants for policy-making bodies. For instance, the Supply Chains in Practice Industrial Collaborator (SCIP)[3] forum at WMG, The University of Warwick provides input through its Director to the Manufacturing Advisory Group of the UK Department for Innovation, Business and Skills (BIS) and the advisory board for the Smart Specialisation Hub. Such forums also lead to long-term relationships between industrial partners and academics essential for providing evidence of social and economic impact. O&SM scholars increasingly have a careful balance to achieve between academic prowess (measured in number of high quality papers) and impact. Taking a problem-centred approach to their work, working through industrial forums to identify the complex problems industry is struggling with, and forming long-term relationships across a diverse range of stakeholders to solve them, could be one way to resolve this tension.

The collaborative management research projects noted earlier are examples of structured exploration and exploitation by practitioners and researchers in order to progress practice and to contribute to theory. They illustrate support for collaboration and the impact of such incentives. More recently, for example, the Horizon 2020 funding programme has begun to support Knowledge and Innovation Communities (KICs). The KICs focus on the creation of a structured collaboration among business, research and education to facilitate an exchange of needs, ideas, research results and best practices in a systematic way. Collaborative activities include matchmaking and networking, validation and acceleration, learning and education, and business creation and support. Although business, research and education partners come with different backgrounds and perspectives, their development of a common vision and mission enables collaborative design thinking in inter-disciplinary research teams.

As a discipline, O&SCM is grounded in practice. However, that does not mean that researchers or practitioners come together easily to explore problems and exploit opportunities of mutual and beneficial interest. According to March (1991, p. 71) "*[e]xploitation includes …refinement, choice, production, efficiency, selection, implementation, execution*", while "*[e]xploration includes … search, variation, risk taking, experimentation, play, flexibility, discovery, innovation*". Practitioners seek to create a balance between exploitation and exploration in practice. Researchers in operations and supply chain management have the opportunity to understand how, through collaborative research, they can explore and exploit the learning arising from the experiences of reflective

[3] For further details of SCIP visit http://www2.warwick.ac.uk/fac/sci/wmg/research/scip/.

practitioners.

6.4 Conclusion and outlook

The EurOMA Young Scholars Workshops evolve around a set of themes, including supervision, teaching, designing research projects, career development and linking research and practice to each other. All of these themes are important for the development of young scholars to mature academics. While this paper has highlighted differences between academic and industrial career paths, it has pointed to the importance for both academics and practitioners, each from their own starting point, to engage with both theory and practice, and also to the role of collaborative research in bridging the gap between theory and practice.

Finally, and to further strengthen active awareness of the relevance of O&SCM theory for practice as well as the central role of O&SCM practice for theory development, this paper also suggests that at least two new themes merit attention:

- Designing solutions – Scholars engaging with practice in the form of collaborative research need the skills to help (and even co-create with) practitioners design solutions to complex O&SCM problems.
- Writing for practitioners – Writing for practitioners requires, for example, that the readability level, particularly of the implications for practice, should be straightforward and clear. Such writing skills may not come easily to all, but developing them opens opportunities for O&SCM as a scientific discipline to improve accessibility to practitioners.

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Table 1: Research methods used in O&SCM research (Godsell et al., 2010)

Research method	1991-1995 (%)	2004 - 2008 (%)	Change (%)
Analytical conceptual	24.5%	16.6%	-7.9%
Literature review	0.0%	3.4%	3.4%
Analytical mathematical	55.2%	49.9%	-5.3%
Analytical statistical	1.1%	2.5%	1.4%
Empirical experimental	0.7%	2.9%	2.2%
Empirical statistical	10.2%	15.7%	5.5%
Empirical case study	8.3%	8.7%	0.4%
Empirical action research	0.0%	0.3%	0.3%
Total	100.0%	100.0%	0.0%
Total # papers	**2002**	**2351**	

Table 2: Research methods used in top 7 O&SCM journals (Godsell et al., 2010)

Journal	Methods (# papers)							Methods (% OM & SCM papers in jounral)						
	DS	HBR	IJOPM	IJPR	JOM	MS	POM	DS	HBR	IJOPM	IJPR	JOM	MS	POM
Analytical conceptual	7	18	9	286	25	18	28	10.1%	42.9%	3.3%	22.3%	12.3%	6.1%	14.8%
Literature review	1	0	10	37	17	3	12	1.4%	0.0%	3.7%	2.9%	8.4%	1.0%	6.3%
Analytical mathematical	20	0	58	791	57	183	63	29.0%	0.0%	21.5%	61.6%	28.1%	62.2%	33.3%
Analytical statistical	4	0	12	4	5	23	10	5.8%	0.0%	4.4%	0.3%	2.5%	7.8%	5.3%
Empirical experimental	5	0	4	29	7	7	16	7.2%	0.0%	1.5%	2.3%	3.4%	2.4%	8.5%
Empirical statistical	30	9	105	63	69	57	45	43.5%	21.4%	38.9%	4.9%	34.0%	19.4%	23.8%
Empirical case study	2	15	67	71	23	3	15	2.9%	35.7%	24.8%	5.5%	11.3%	1.0%	7.9%
Empirical action research	0	0	5	3	0	0	0	0.0%	0.0%	1.9%	0.2%	0.0%	0.0%	0.0%
Total # papers by year	**69**	**42**	**270**	**1284**	**203**	**294**	**189**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table 3: Three Types of Science and their Key Characteristics (Van Aken, 2001a, 2001b, 2001c)

Type of science	Formal	Design	Explanatory
Examples	Philosophy, mathematics	Engineering, medicine, management	Natural sciences, large sections of the social sciences
Key question	True or false?	How should things be?	What is the nature of things?
Objective	Building systems of propositions	Solve problems, or improve the performance of existing entities	Describe, explain and possibly predict observable phenomena within a field
Key features	Internal logical consistency	Develop valid and reliable knowledge in the form of field and ground tested technological rules	'True' propositions which are accepted by the scientific forum as true on the basis of proof provided

Table 4: Main features of the positivist and realist logics (Ackroyd, 2009, p. 538)

	The conception of explanation ***(Something is explained when)***	**The process of discovery** ***(Theory is developed by)***	**The process of knowledge construction** ***(Knowledge is improved by)***
Positivist logics			
Inductive	A reliable generalisation from well-attested data (a 'valid' sample is required)	Systematic data collection and the use of inductive techniques to produce valid generalisations	Searching for associations between variables and comparing with the probability of a chance outcome
Deductive	A conclusion deduced from known premises or theoretical postulates	The production of law-like statements in an abstract form, from which further testable postulates are inferred	Testing propositions deduced from theoretical postulates; trying to refute law by showing predictions false
Realist logics			
Abductive	An elemental account for a basic process or mechanism, or something that is seen as the product of such a mechanism	Combining the ideas of participants, with recognition of the powers and tendencies of other entities, to describe a generative process	Building an account of how generative processes work themselves out in given context
Retroductive	Established as a distinctive process, and the conditions of its existence have been elaborated	Answering the question, what are the conditions for the existence of this generative process?	Locating accounts of particular generative processes in a broad socio-economic context

Table 5: Collaborative management research projects – a sample set

Project	Dates	Focus	Academic researchers	Practitioners
NALP	1997-2000	Achieving WCM through action learning	University researchers - Ireland	Manufacturing and service firms
COIMPROVE	2001-2004	Collaborative improvement in the extended manufacturing enterprise	University researchers – Denmark, The Netherlands, Italy, Ireland	Manufacturing firms
HYDRO BPT	2011-2016	Energy recovery from the public water system	University researchers – Ireland, Wales	Public and private water firms, manufacturers
TRADEIT	2013-2016	Innovation and entrepreneurship in traditional food producing firms	University researchers – Ireland, UK, Spain, Portugal, Germany	Food producers – Ireland, UK, Spain, Italy, Finland, Germany, Poland, The Netherlands

Table 6: Four cases of the dynamic interplay between theory, research and practice

Case 1	Market Oriented Manufacturing Systems – Theory and Practice	1993
Case 2	Semiconductor Benchmarking	1996-1998
Case 3	Life Cycle of an Industrial base for Mobile Phones	1998-2005
Case 4	Implementing Automotive Mindset	2008-2014

Table 7: A classification of the cases

	PhD study	Benchmarking study	Industrial Base implementation	Automotive Mindset behaviour	
	Case 1	*Case 2*	*Case 3*	*Case 4*	
Abductive Research	X				Research process emphasizes the search for theories suited to an empirical observation
Management Research	X	X	X	X	Research embedded in the complexity of the practical world of organizations and people
Design Science	X	X	X	X	Seeks to address how things should be, solve problems, improve performance of existing entities

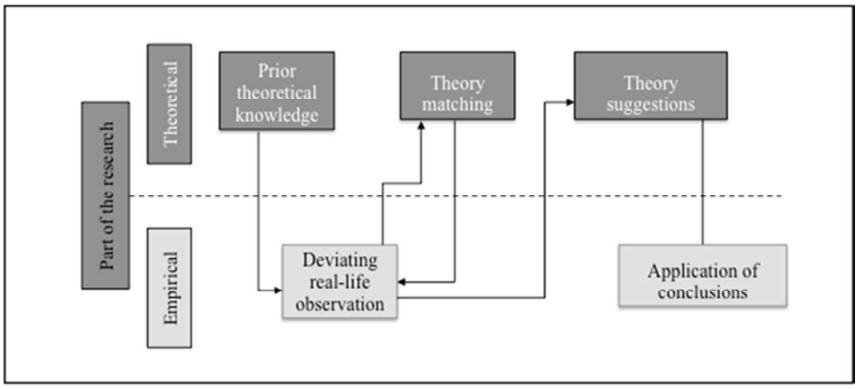

Figure 1: Summary of the abductive research process (after Kovács and Spens, 2005)

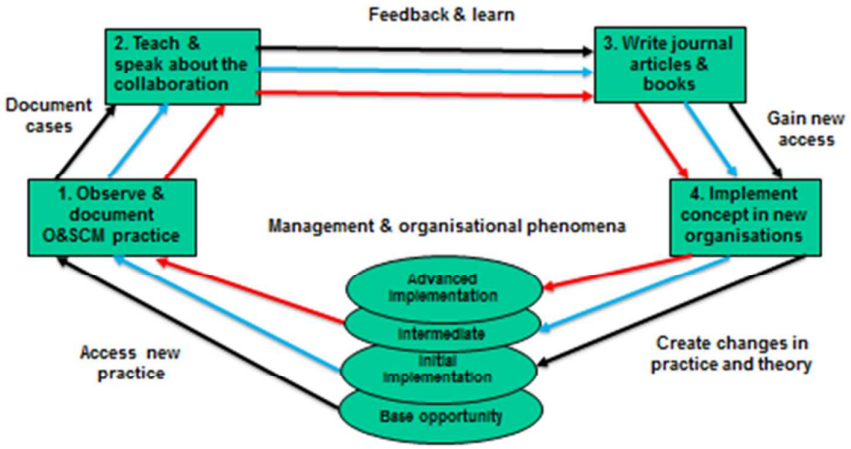

Figure 2: Innovation action research cycle in O&SCM (after Kaplan, 1998)

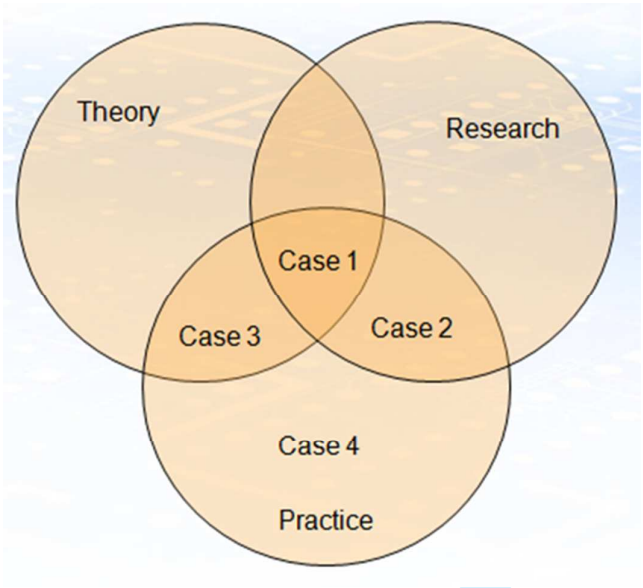

Figure 3: The dynamic interplay between theory, research and practice

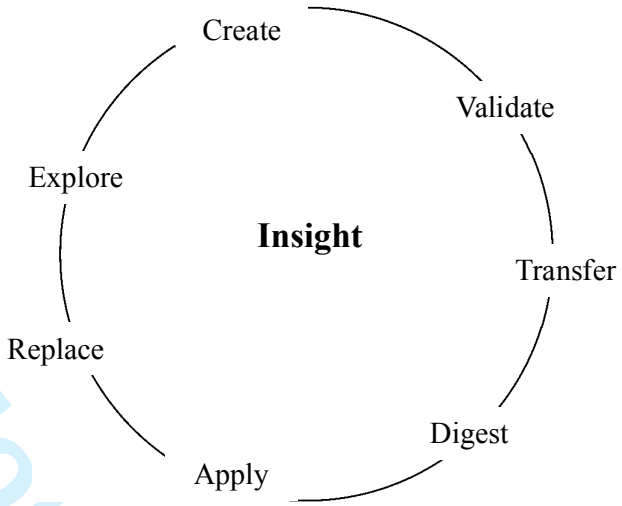

Figure 4: The lifecycle of insight