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Professional groupings and customized deliveries in industrial organizations

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Customization is a phenomenon that has always been significant on industrial markets¹. In their literature review, Spring & Dalrymple² map different distinctions between levels of customization. Of particular interest are the higher levels of customization, what Shapiro would refer to as “custom-designed”, Sharma: “standard, modified to customer specifications” & “customized product”, and Lampel & Mintzberg: “tailored customization” & “pure customization”³. Customization as a topic in academic writings has, from a manufacturing strategy perspective, been discussed rather limitedly⁴. It has to some extent been implied in association with service and innovativeness⁵ and the links between for instance customer co-innovative activities and customization has been established quite recently⁶. Recent research associated with customization has been spurred by the emergent ideas of mass customization⁷ and modularity for flexibility and innovation⁸. Although the issues of modularity are interesting, mass customization and the larger volumes associated with it is not a key focus in this paper. Nevertheless, it is worth noting the links between customization, without being mass

¹ Spring & Dalrymple, 2000

² Spring & Dalrymple, 2000

³ Spring & Dalrymple, 2000 review including Shapiro, 1977; Sharma, 1987; Lampel & Mintzberg, 1996.

⁴ Spring & Dalrymple, 2000

⁵ Spring & Dalrymple, 2000

⁶ Athaide et al, 2003

⁷ Spring & Dalrymple, 2000

⁸ E.g. Kotler, 1989, Sanchez & Mahoney, 1996

Professional groupings and customized deliveries in industrial organizations

customization in particular, and innovation. Organizations working with higher levels of customization have, according to Nemetz & Fry⁹, invested in order to have a flexible production process. In turn, a high level of customization in production opens for innovation and new product development¹⁰.

Customization of deliveries is also a central characteristic of professional service firms¹¹. Studies on professionals, knowledge workers or highly skilled workers within professional service or knowledge intensive firms and the importance of for instance their educational background and belongingness to particular professional groups, is an area that has been discussed by for example Alvesson and Tam et al¹². 'Professionals' is a category that is somewhat narrower than 'highly skilled workers' or 'knowledge workers'. Among the characteristics of 'professionals' one may mention: Higher education, application and improvement of knowledge, discretionary efforts¹³, professional association and code of ethics¹⁴. Engineers and scientists are among the types of workers that can be labeled as knowledge workers¹⁵ and professionals¹⁶. Educational background and professional belongingness is an issue that has been taken into account as important for organizational and strategic matters in professional service firms¹⁷. But the implications of an increased dependence on professionals and high levels of customization of deliveries in other organizations than professional service firms or the alike, with primarily non material deliveries,

⁹ Nemetz & Fry, 1988

¹⁰ Sanchez & McKinley, 1998

¹¹ Löwendahl, 1997

¹² C.f Alvesson, 2000, Tam et al, 2002

¹³ Löwendahl, 1997

¹⁴ Alvesson, 2000

¹⁵ C.f. Dove, 1998; Nomikos, 1989; or engineers viewed as knowledge workers in Kim & King, 2004

¹⁶ C.f. Löwendahl, 1997, Bigliardi et al, 2005

¹⁷ C.f. Löwendahl, 1997; Fostenlökken et al, 2003

Professional groupings and customized deliveries in industrial organizations

are far from obvious. For instance, an increasing degree of professionals in an organization may imply organizational and managerial challenges. Of interest is for example management of knowledge workers in association with innovative activities¹⁸.

This study focuses on organizations on industrial markets that are not working entirely with non material deliveries, as advertising agencies or professional service firms do, but nevertheless supply highly customized deliveries. An organization acting on an industrial market, although it might supply highly customized deliveries based on a high degree of professional work, is closely related to its products and the processes linked to developing and producing them. Nevertheless, an increased reliance on professionals raises questions of how educational background or belongingness to professional groups may be linked to organizational processes inherent in supplying highly customized deliveries, and consequently abilities to be innovative.

Thus, how is a focus on supplying highly customized deliveries on industrial markets reflected in the way that professional groupings emerge and develop within the organization?

Customization

Customization projects can be seen as vehicles for learning in industrial firms that also include tangibles in their deliveries, such as the case organizations in this study. Choosing projects therefore tends to be important in these organizations. As one of the senior managers in Spring & Dalrymple's¹⁹ study so eloquently puts it: "The customer is always right, but I can choose my customers..." This corresponds to Fosstenlökken et al's²⁰ argument on professional service

¹⁸ C.f. Amar, 2004

¹⁹ Spring & Dalrymple, 2000, p 462

²⁰ Fosstenlökken et al, 2003, p 876

Professional groupings and customized deliveries in industrial organizations

firms: “It is not obvious that the clients, who are ‘right’ from an operational or profit-maximization point of view, are always the same as the clients who are ‘right’ from a knowledge-development point of view”. Thus a focus on customization in deliveries provides a link between professional service firms and what would be regarded as industrial and non-professional service firms.

Customization is a key characteristic of professional services²¹. Professional service firms can in turn be seen as one of the key examples of organizations with a high degree of professionals. It can also be worthwhile noting that competence characteristics that can be associated with professional service firms are seen as prominent when moving towards integrated deliveries of products and services in as varying industries as the computer and electronics sector and capital intensive manufacturing²². What is especially brought to attention are competences that are related to interaction with the customers in order to diagnose needs, solve problems and adapt deliveries. Since client interaction is the key driver in firms completely devoted to business services, this interaction is likely to be increasingly important for the direction of the firm if an organization incorporates more and more customization and consequently intense, complex customer interaction. This will probably affect what direction competence development takes in the organization and is likely to have effects on the organization and the conceptions of the business within and outside of the organization.

Organizations working with higher levels of customization have, according to Nemetz & Fry²³, invested in order to have a flexible production process. In turn, a high level of customization in

²¹ Löwendahl, 1997

²² The modified model in Windahl et al, 2004 based on Shepherd & Ahmed, 2000

²³ Nemetz & Fry, 1988

production opens for innovation and new product development²⁴. Customization furthermore involves a close connection between design and manufacture²⁵. This interconnection indicates an organizational setting where activities that utilize problem solving competence, such as professionals, seem to be directly related to product characteristics. Problem solving in engineering work can be said to be depending on the combining of competence, knowledge and information of various types and resident in various sources²⁶. As resourcing becomes more open to external acquisition and accessing ideas such as the “extended firm” appear where suppliers and users collaborate more closely²⁷. The need for collaborations are the results of the complexity, novelty or scarcity of the technologies that need to be utilized in order to solve complex problems that are related to direct usage of the firm itself or due to the market and customer needs of the buyer²⁸. For the buyer, the accessing²⁹ and/or acquiring of technology related to these collaborations are sources of learning and competence development. It complements the internal R&D and is linked to diversification of technology towards more and more technologically complex solutions³⁰. The complex technological reality requires collaboration in many forms and the buyer-supplier interaction is one of the key collaborations.

Solving customer (or client) problems is the central function in the “value shop” configuration, which also can be associated with professional service firms³¹. The value shop relies on intensive

²⁴ Sanchez & McKinley, 1998

²⁵ Spring & Dalrymple, 2000

²⁶ Henriksen, 2001

²⁷ Tidd et al, 1997 with references to Lamming, 1993

²⁸ Tidd, 1997

²⁹ Grant and Baden-Fuller, 2004

³⁰ Tidd, 1997 and Granstrand et al, 1992

³¹ Stabell & Fjeldstad, 1998

technology³² to solve customer problems. The problems can be defined as differences between an existing and a desired state. The success of employment of the intensive technology rests on the "... custom combination of selected capabilities as required by the individual case or project"³³ The selection, order and application of resources vary due to the problems. The matching of problems and problem solving are the basis for the allocation of resources in the value shop. The flow of activities in a value shop configuration is cyclical and iterative and the diagnosis of a problem moves back and forth between hypothesis and data collection. "... feedback both from trying to generate a solution and from implementing a chosen solution might require redefinition of the problem or search for alternative solutions."³⁴

On the other hand, industrial organizations of the kind focused on in this study supply deliveries with tangible content and are likely to benefit from reuse and repeatability in its output. Therefore we also have to consider the logic of what Thompson³⁵ would refer to as long-linked technology. In the descriptions by Stabell & Fjeldstad the value shop can be contrasted by the value chain, which utilizes long-linked technology. For the value chain, the transformation is central: "Value chains sell products that are the outcome of a transformation. The customers pay for the quality of the product.", whereas, "Value shops sell competencies and approaches to help solve unique problems. The customers pay for solutions to – or effort spent on – their problems."³⁶ Thus, the professionals in industrial organizations supplying highly customized deliveries are likely to act within either or both of these logics.

³² Thompson, 1967

³³ Thompson, 1967, p18

³⁴ Stabell & Fjeldstad, 1998, p 422

³⁵ Thompson, 1967

³⁶ Fjeldstad & Haanaes, 2001, p 5

The cases

Two of the in-depth cases in this study are organizations that are units within the Trelleborg Group, a global industrial corporation, headquartered in Sweden. Close access is made possible through research collaboration between the Trelleborg Group and the School of Economics and Management at Lund University, Sweden. Unit RD works towards a specific niche and primarily within a specific industry whereas unit TV works towards a set of niches within several industries, but the most complex deliveries are focused on one specific industry. Both organizations rely on concepts on various levels of specificity that are utilized in order to primarily deliver small series of highly customized solutions. Each new delivery requires problem solving efforts and the flexibility of the concepts or the subparts utilized. When it comes to manufacturing it is worth noting that the automation degree is seen as relatively low but that the flexibility is seen as rather high. In TV the distinction between various levels of development i.e. customization efforts and ‘underlying solution’ development is rather clear formally. But the underlying development staff is involved in customization through direct project support.

An additional case outside of the Trelleborg Corporation supplements the two. The third organization studied, here referred to as “Automation”, delivers highly customized automation systems to a wide variety of industries. The deliveries consist of hardware as well as software parts, but the primary amount of customization is done through adaptation of the software part of the systems. This makes it different from the other two cases where the physical character of the deliveries is dominant. All of the case organizations have a rather high degree of highly skilled workers and professionals, primarily represented by engineers.

Products and underlying solutions

The cases indicate that firms working with high levels of customization face assignments that require interaction with the buyers and that they also include a high degree of professionals and problem solving. But this does not necessarily mean that they have no ability to apply repeatability through standardization and re-use. Löwendahl³⁷, in the case of professional service firms, shows how some repeatability can be reached through formalized innovation structures into “ready solutions”. The cases in this study, in a rather similar fashion, show that repeatability is pursued simultaneously with the pursuit of high levels of customization of deliveries to customers.

The output that is produced by the organizations has either an external application, as products, or an internal function as platforms for future deliveries. The ‘platforms’ in the cases have a limited standardization of interfaces³⁸ (as discussed in association with modularity and mass-customization³⁹) and are therefore denoted ‘underlying solutions’⁴⁰ in this study. Underlying solutions can be in the form of different types of materials, systems, and parts etc that are developed over longer time perspectives. The high levels of customization in the final deliveries seem to limit the use of modular approaches in underlying solutions since strongly imposed modular boundaries might hinder flexibility in customization. The search for repeatability nevertheless sets a number of boundaries within which a certain level of flexibility is allowed both for the day to day customization tasks and for longer-term development. This does not mean that

³⁷ Löwendahl, 1997

³⁸ Therefore they may well serve as a base for multiple products but the level of standardization that enables common interfaces and subsystems is rather low. Compare with the description of platform characteristics in Meyer & DeTore, 2000 with references to Meyer & Lehnerd, 1997.

³⁹ Athaide et al, 2003

⁴⁰ This is a label inspired by Löwendahl, 1997

the boundaries are always very rigid – that depends on the type of boundaries and of the type of business, and probably the rate of development required in the industry. The underlying solutions vary according to formality, their closeness to delivery, tangibility and with the level of potential reuse.

We can view the cases as having either a more linear or a more hierarchical reuse structure. The hierarchical structure could be described as consisting of an underlying solution, which is internally oriented, and final deliveries that draws upon the functionalities of the underlying solution. In the linear structure on the other hand, prior deliveries (i.e. externally oriented output) are reused in order to construct new ones. In the cases RD typically has a linear relationship between its deliveries. The Automation case reveals strongly formalized underlying solutions and a hierarchical structure. TV combines a linear and a hierarchical structure.

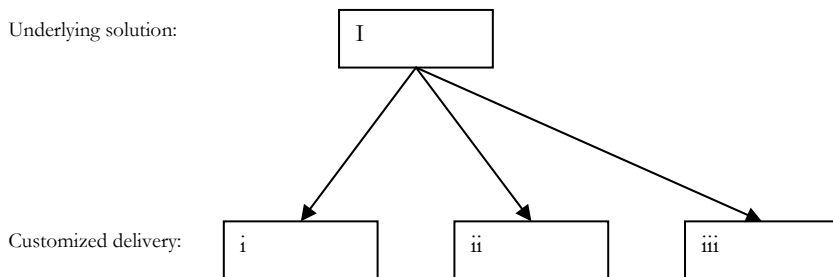


Figure 1: Hierarchical relationship between an underlying solution and customized deliveries

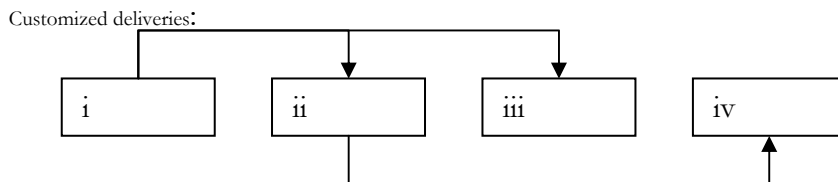


Figure 2: Linear relationship between customized deliveries

Professional groupings and customized deliveries in industrial organizations

Creating and developing underlying solutions that are formalized and have a high reuse level, requires specific development projects which are not primarily related to one or a few customer projects. Thus whether something is an underlying solution or not is rooted in how activities are allocated in the organization. If the organization commits to identifying a set of requirements to be covered repeatedly and develops entities that enable reuse within that set of requirements, the outcome is an underlying solution.

Problem solving activities

Activities in the organizations are influenced by the project directed ways of working in the organizations. Projects are oriented towards either short-term customization projects or longer-term development initiatives. The customization projects are aimed at solving customer problems. The longer-term projects on the other hand are aimed at providing repeatability and reuse. For clarification we may illustrate the relationship between these logics in the following way. Long-term development is either the outcome of projects fully devoted to long-term development goals or an aggregate of customization projects. Automation is the most distinct example of an organization with clearly defined long-term development separated from customization efforts.

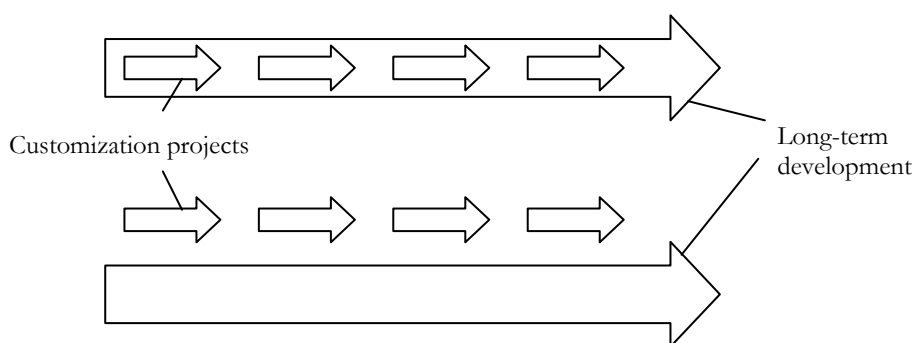


Figure 3: Long-term development as an aggregate of short-term projects vs. formalized long-term development in its own right.

Engineer types and competence concentrations

Staff, and especially engineers working with development and design tasks, can be divided roughly in two groups:

- Technical intermediaries who have insight and experience of application of deliveries and the customer's technological realities. They are also experienced in handling social and business situations with customers.
- Technical specialists who first and foremost are focused on their delimited technical development tasks.

These two types of staff work either in an integrated fashion or more divided. The organization as an effect displays either cross-utilization of these competences, a concentration of competences into separate entities, or a combination of both of these extremes. RD is an example of a highly integrated way of utilizing competences. Automation is strongly divided, resulting in structures where long-term development units supply underlying solutions to a network of internal as well as external customizing units. TV has two entities that are not as clear cut and competences are often cross-utilized in projects. Thus, the reuse, activity and competence configurations seem to correspond to each other. But then what role does qualities often associated with professionals such as identity and belongingness to different professional groups play in this context?

Professional groupings

Working with highly customized deliveries requires not just in-depth specialist competence in order to provide the solutions but also high competence levels in the technical interface towards the customer, i.e. the technical customization problems. This is something that the staff working directly with customer problems, the technical intermediaries, must possess. The customer perspective is highly relevant for this employee group whereas it is more remote for the other

one. The technical competence involved in developing the in-depth solutions is not the same as the technical competence required to understand and approach customer problems. In the cases, the customization side and the underlying solution side of the organizations are more or less closely associated with different competence profiles and educational backgrounds. This is visible in all of the cases although most clearly in the Automation case. It is somewhat less clear in the TV case and least prominent in the RD case. Technical intermediaries have a competence set that integrates sales and technical competence. But the technical competence is often directed towards customization problems and less prominent with regards to in-depth technical details. Thus it is important to communicate or in other ways provide support from the underlying solution side of the organization. In general, firms working with higher levels of customization have a stronger need for cross-functional and divisional organizational learning⁴¹.

An issue that is present in all of the cases, but emerges as especially clear in the Automation case, is how professional groups with different educational background correspond to an emerging division between customization projects and long-term development work associated with underlying solutions. But the concentration of competence types due to technical competence focus and/or professional belongingness may not be matching the needed competence set perfectly. I.e. customization and long-term development oriented units have a tendency to be associated with particular technical competence profiles, respectively. For customization projects this may limit the utilization of competences that have become primarily associated with underlying solutions. And similarly, it may limit the way that underlying solution development can access competences mostly associated with customization. The TV case indicates that its two technical competence areas must meet in both the customization efforts and the work with

⁴¹ Drejer & Riis, 1999

Professional groupings and customized deliveries in industrial organizations

development of new solutions. Consequently, a clear division based on technical competence areas does perhaps not correspond to the real needs of the projects of customization or solution development.

The relevance of professions, and more particularly the educational backgrounds, of the employees indicate that although it would perhaps be beneficial to look beyond definitions of highly skilled workers or knowledge workers based on their profession⁴², professions and educational backgrounds seem to have an impact on organizational structures and competence concentrations. Thus it is a perspective that is beneficial to apply in order to reveal if these concentrations happen due to the resembling background of employees in departments or sections or if they are truly the result of trying to find the appropriate competence configuration for the tasks to be done. In all of the cases it is visible that cross-competence utilization is important, especially when activities require the use of both types of competences.

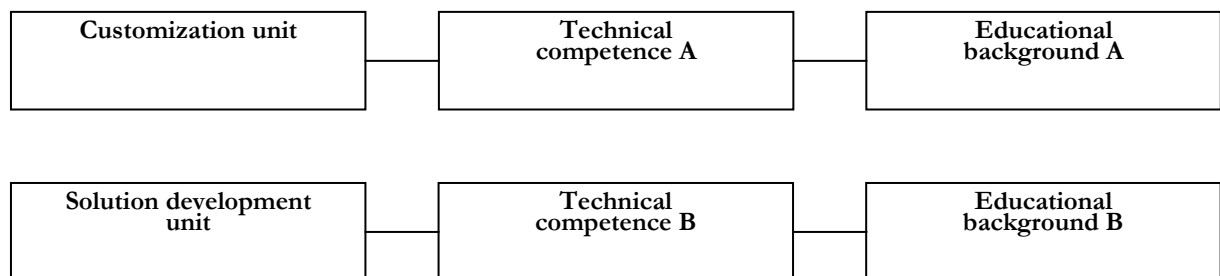
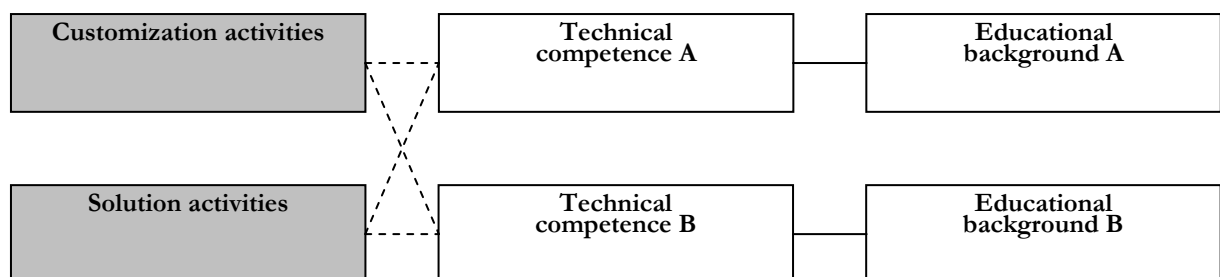


Figure 4: Links between functional organization and educational background.



⁴² C.f. Kelloway and BArling, 2000; Choi & Varney, 1995; Dove, 1998

Figure 5: Cross-competence utilization and links between functional organization and educational background.

What is also important to mention is the standard of the education of the staff in the cases. Fosstenlökken et al in their study compare an engineering design consulting firm with a communication consulting firm and find that engineering design consulting is an established industry where the professionals have a background from “highly recognized, science-based education programmes”⁴³. In a similar fashion, the cases in this study all have a large amount of staff with a background from highly established (engineering) education programmes. In this study though, several different groups of professionals with differing technical educational focus (primarily two main groups per organization or network) work together within the same organization or network. Possibly, the similar educational background strengthens the internal identification within such groups⁴⁴. The concentration of a particular type of educational background to each of the functions that takes place may be in order to reach a type of “critical competence mass” to be able to solve the most common problems at hand. It may also be due to identification between the activity of the groups and the educational or professional background. Consequently, it may spur recruitment of new staff within the same professional group. The emergence of strong such concentrations may further ‘widen the chasm’ between the customization and solution side of the business which can result in problems. Thus, organizations pursuing repeatability and reuse strategies by establishing capabilities for development of underlying solutions may face a lower degree of customization and innovation ability, partly as an outcome of professional groupings rooted in their differing educational and professional association.

⁴³ Fosstenlökken et al, 2003

⁴⁴ Compare with Galunic & Rodan, 1998 with regards to identities, competence combinations and innovation.

Preliminary findings

This paper draws on parts of the results of a study still in progress. Among the preliminary findings it seems appropriate in this context to mention that:

- Professional groups associated with differing technical competence sets may enhance the division into a customization and a solution part of the organization. The cases indicate that this may not always be an outcome of a process where the organization adapts itself to the external demands on the organization. Instead the professional belongingness may strengthen the dividing line and also drive the development towards such a division.
- If an organization is more clearly divided into one customization function and one aimed at long-term development of underlying solutions, and these are associated with different professional groups, then there appears to be a need for efficient communication and information processes in order to draw on competences across the dividing line. This seems to be especially important if a higher innovation and customization ability is pursued.

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