Expert Journal of Business and Management (2014) 2, 62-71
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Business.ExpertJournals.com

Performance Improvement by Functional-Respectively Competence-Diversity in New Product Development

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This paper demonstrates the latest research results of the relationship between cross functional product development teams and project respectively team performance. The aim of this paper is to support the basic hypothesis of the author, which is "The higher the technical draughters' integration intensity in a 3D CAD (Computer Aided Design) product development project, the higher the economic and socio-psychological efficiency within that project", with the findings of recent research. Besides studying standard references, a systematic inquiry, using 2 scientific databases, Emerald and EBSCO was performed to study cross-functionality in New Product Development (NewPD). The increase of functional diversity in development teams which is supposed to promote performance is an inadequate variable. Essential to make a cross-functional team successful are competence diversity and familiarity. The intention is to apply competence diversity not only for companywide teams but also in single working units as in mechanical development departments of medium-sized companies.

Keywords: *New Product Development, Functional-Diversity, Competence-Diversity*

JEL Classification: *M54 - Labor Management*

1. Introduction - Research Question

The company which is faster in presenting convincing concepts determines the customer's mindset and has therefore a better chance to succeed in the current, intense competition. Against this background the ability to transfer new ideas to commercial products in a timely manner is an important competitive factor with high influence on the corporate success today (cf. Scheer, 2003; Hirzel, 1992). A survey concerning problems in research and development departments, held by Prof. Dr. Klaus Ehrenspiel, showed the following: the dominating problem of the development process where almost all employees, almost every company, almost all hierarchical positions and almost every line of business meet are project durations and deadlines (Ehrlenspiel, 1995, p. 149). In departments concerned with the development of products, reaction time, processing time, lead time and innovation performance are on the one hand affected by the availability of qualified members of staff. On the other hand members of staff within the development departments are comparatively expensive. The high percentage of qualified employees - more than half of them (55%) are academic personnel, around 20% are technician (BMBF, 2004, p. 178 sq.) - implies high personnel costs for a company. Owing to a enormous deficit of qualified employees, which is already now lamented and which will

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Article History:
Received 20 October 2014 | Accepted 3 November 2014 | Available Online 11 November 2014

Cite Reference:
Staita, C., 2014. Performance Improvement by Functional-Respectively Competence-Diversity in New Product Development. *Expert Journal of Business and Management*, 2(2), pp. 62-71

probably even increase (cf. Wittenstein, 2006, p. 66; BMBF, 2004, pp. 479 sqq.), personnel costs for this group of employees are likely to incline in the following years. That is why the appropriate number of qualified personnel will become even more and more expensive, but in the meantime it is one of the most crucial basic conditions of the ability to innovation (Kliesch-Eberl and Eberl, 2009). In the face of the importance of high costs for competitiveness and innovativeness, new ways of thinking have to be considered. One approach towards an economical and socio-psychological efficient development process in a 3D CAD NewPD engineering environment could be the consistent assignment of technical draughts people in mechanical development departments in medium-sized companies who would relieve the development engineer from all part and assembly orientated documentation. Also, according to the BMBF (2011), there is the ability to innovation of small and medium-sized companies especially strong related to the availability of qualified and experienced employees. Not only is the number of qualified staff in medium-sized companies for the above mentioned reasons small, but it is also getting even shortened through the typical forms of work organization. Not - as you can often register in large companies - specialization is the problem, but mainly the engineers' overloading through a lot of side tasks. The development engineer has to fulfil several tasks at the same time: he works in sales; accompanies the manufacture and assembly or the work preparation for problems with new products, is responsible for the order of tools plus machines (Ehrlenspiel, 1995, p. 277ff). Interruptions and unforeseen tasks are normal for his or her daily routine. Time for NewPD is drastically restricted. Additionally there occurred due to the 3D CAD growth another side task to engineers in development departments of medium-sized companies. The 3D CAD revolution led to a personnel structural change in medium-sized mechanical development departments, which are responsible for the development of new products. Medium-sized companies were successfully conveyed that engineers can - on the side - easily take over product documentation with this 3D CAD software. Technical draughtspeople who did this kind of work so far declined rapidly. 1999 the German product development industry had 143.483 technical draughtspeople under social insurance contribution - 2011 there were only 120.379 left. The population index declined from 100 in 1999 to 84 in 2011. In the same time frame the population of German engineers increased from 637.935 to 708.476 people under social insurance contribution. The population index increased from 100 in 1999 to 111 in 2011 (IAB, 2011). As a consequence the overall ratio between technical draughters and engineers in Germany went from 0,225 in 1999 to 0,170 in 2011 which is a reduction of 24.5 %. The decline in German medium sized companies was even higher. As a matter of fact the 3D CAD software cannot produce the product documentation automatically and the engineer in medium-sized companies takes over the product documentation (mainly part and assembly drawings) which is intensive time consuming. One of the engineer's main tasks lies in the conceptualization of future and innovative systems. It is a complex process which requires both analytical skills and creativity to generate innovative solutions for the next generation of commercial products. Developing new concepts for products is a creative field of activity where engineers use their knowledge well-directed in order to give systems particular functions, forms and traits. Owing to the above described engineer's overload with side tasks (multi-functionality), in practice proven concepts which offer with given resources the best possible solution are often preferred (Ehrlenspiel, 2007, p. 241 sqq.). These exploitation processes with their unsound fixation to existing solutions is one big hurdle for innovation (Kliesch-Eberl and Eberl, 2009).

The main task of technical draughtspeople is the drawing up of norm-proven technical drawings as draft, itemization or assembly drawing in form of outlines, details, views and sections. Besides they are responsible for technical documentations and they carry out project entries, evaluations plus calculations. In the course of the management project "Socio-economic analysis of technical draughter integration in NewPD processes in mechanical development departments of medium-sized companies: A concept to cope with increasing shortage of engineering resources", which is currently in progress, a coherent ratio between engineers and drafters within a 3D CAD NewPD environment should be found with the aim to carry out efficient, fast, innovative and competitive product development. The concrete research question is: Does the employment of technical draughtspeople in mechanical development departments of medium sized companies within a 3 D CAD engineering environment increase the economic and socio-psychological efficiency? And the basic hypothesis is: The higher the technical draughter's integration intensity in a 3D CAD product development project, the higher the economic and socio-psychological efficiency within that project. To validate this hypothesis the mentioned management project consists of a theoretical part, a clarification of common scientific and logical rules and the empirical observations, analyzed by a cause-effect-model. This paper select one of the essential areas to establish an efficient development team, the cross-functional team composition by considering scientific literature and relevant research results on the one side and the placement and tracking of that aspect in the cause-effect-model (part of that management project in preparation) on the other side.

2. Literature Review - Theoretical and empirical Evidence

2.1. Weakness of traditional functional Organization

The humanization movements in the first half of the 20th century created with the attempts to overcome the negative consequences of Taylorism by job enrichment, job enlargement, use of different abilities etc. (Staita, 2012) led to a change in the business climate which in the second half of the 20th century imposed new roles for business organization and style of leadership. This reconsideration of the business structures had to follow nearly inevitable the new understanding of humans in the working environment and the so far rigid organizational structures obtained practical and scientific interest. And – not coincidentally – we find already in the year 1966 in one of the standard references of business administration (Gutenberg 1966, pp. 262) in the section, describing the pattern of cooperation, a link to American management literature, discussing cross-functionalization or -contacts since the early 50s (Dale 1952, Peterson et. al. 1953). Scientists as well as practitioners quickly hypothesized that there is much more potential to be revealed by using human diversity adequately in success related processes. By taking the process of design and NewPD - a common application in praxis and theory for demonstrating the changes in business organization - the initial situation is described in detail by Ehrlenspiel (1995, p. 119 sq.). You can hardly better start the discussion than to look at Ehrlenspiel's figure 4-1-22, p. 148, figure 1 in this paper. He shows in a highly simplified way the process of building new products in a conventional, functional organization. Although every task within a department may be/is optimized the idea of the final outcome, the competitive product ready for the market, is not really in the center of the respective minds and the activities.

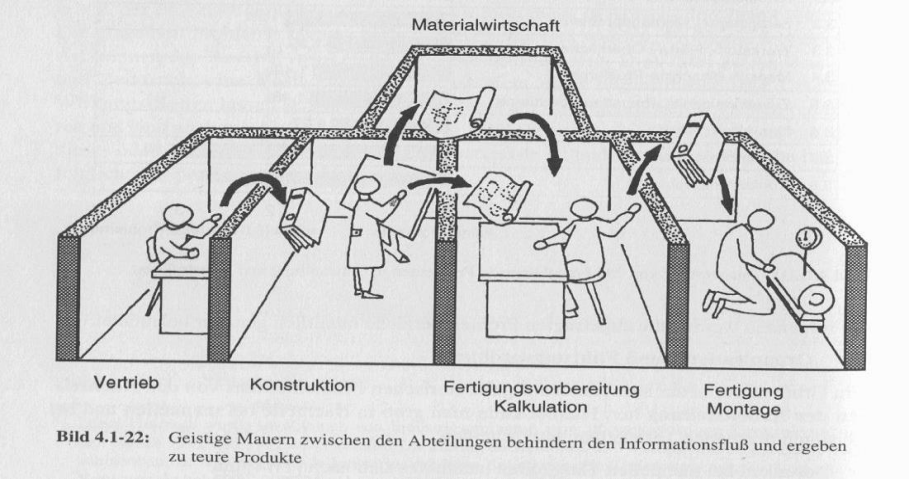

Figure 1. *Mental walls obstruct the flow of information between departments and result in expensive products*
Source: Ehrlenspiel 1995, p.148

According to Ehrlenspiel's experience this attitude, he is calling it "Mauerdenken", is the main reason for waste of time and for quality and cost problems in companies. This experience is shared nearly by all members of staff, every company, all hierarchical positions and every line of business. Not surprising that this ranking leads to the "faster competitor" as a new category of challenge in a harder global competition.

With the example of the building of a new auxiliary heater for the automobile industry a bundle of reasons for time, quality and cost problems have been collected by Ehrlenspiel under this organizational environment: vague definition of aims, inadequate communication, operation scheduling and coordination, insufficient use of methods (e. g. market analysis, risk analysis), disregarded individual human behavior (e. g. small communication of introvert persons) etc. One of the major points is the adequate flow of information and any disturbance lead inevitably to an increase of changes with its inevitable additional cost and time and possible loss in quality. What must get subject to greatest attention is - apart from the normal run-off - the feedback of relevant information at the right time. To put that in operation and to bring again the final outcome, a high-class product, into the center of all activities of a company there is an urgent need to tear down the department walls by establishing a new integrated, innovative thinking, a change of the formal organizational structure and an adjustment of the style of leadership.

The following figure 2 indicates the high intensity of the flow of information, downstream as well as upstream, the feedback, ideally to be allowed for a successful building of new products. Core feedback information are coming from the production and the market area. Due to the great effects on production cost resulting from R&D close coordination in respect to best available production facilities (machinery, skill of

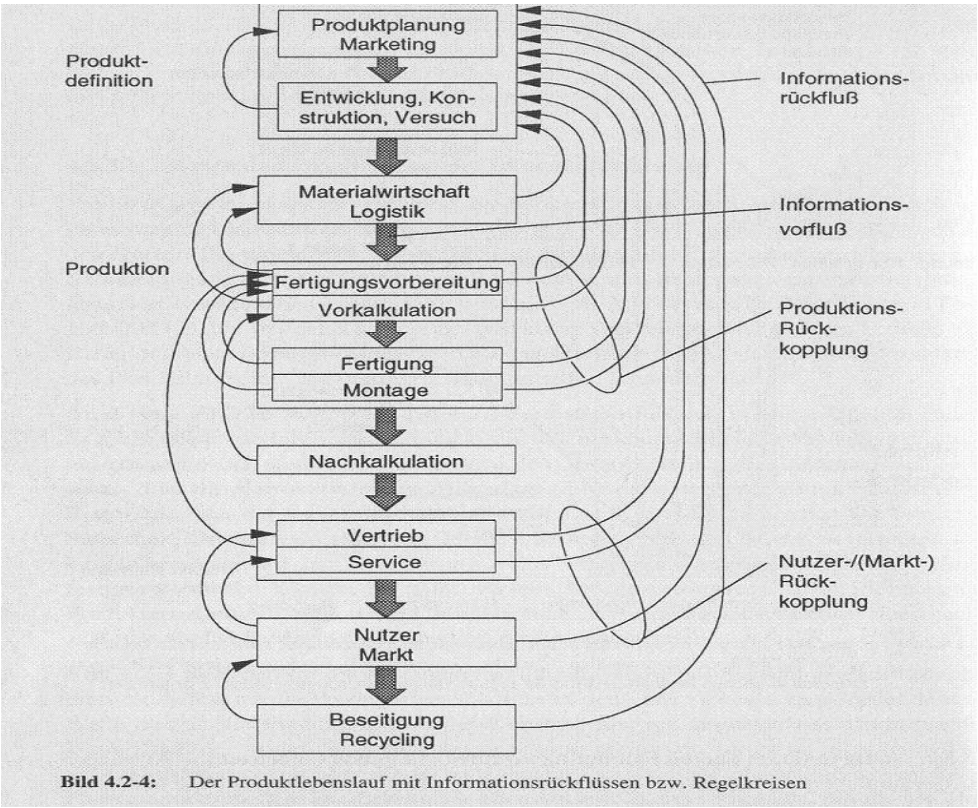

Figure 2. *The product life cycle with information loops respectively feedback controlled loops*
Source: Ehrlenspiel 1995, p. 156

employees etc.) is to be cultivated. Tight cooperation with the market area makes sure that the requirements of the customers are regarded adequately - without losing the benefits of standardization. These balancing processes about possible but not literally necessary traits of a new product are of high priority in respect of product cost, which get determined up to 80 % in the development departments (Ehrlenspiel 1995, p. 555) and these balancing processes are deeply simplified in an environment of the required new integrated, innovative thinking. But even with this new understanding figure 2 actually calls for more transparency of the process of building new products. The trouble is that with the conventional, functional organization the flow of information is regimented by a huge number of official points of intersection (interfaces) creating a huge number of documents, cost and - waste of time.

Ehrlenspiel (1995 p. 157) quotes an assessment of the management consultant A. D. Little, resulting in the statement that one third of the original costs incurred to overcome the official points of intersection. And the aggregated time for transfer, the idle periods and the break-in time amount up to 90 % of the complete lead time of an order (Führberg-Baumann and Müller 1991, p. 52 sqq.).

2.2. Cross-functional Team

The main concern must be to reduce the flood of information transports and documents by a radical change of the organizational structure accompanied by an adequate style of leadership and to establish a team with team members from all relevant functions, a cross-functional team. The composition of the team, a genuine leadership function, may differ, depending of the individual characteristic of the project in general and with the progress made (e. g. a lawyer must not always be available). The consequent and radical transition from all the individual functions detailed in figure 2 is made with figure 3, the information flow in a cross-functional team: The necessary information can flow directly from expert to expert within the team and without the bulk of official documents.

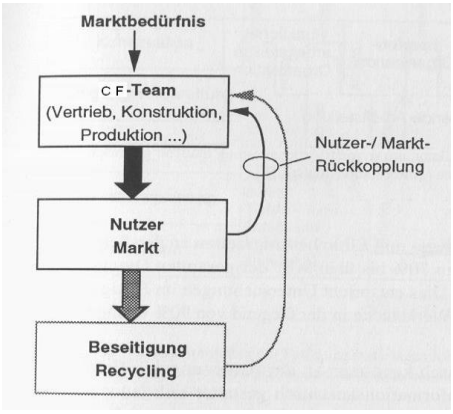

***Figure 3**. Information flow in a Cross-Functional Team*
Source: Ehrlenspiel 1995, p. 157

There is only one essential feedback left, the information from the market, from the - potential or actual - user of the new product. As already mentioned in section 2.1 first ideas to create teams to overcome many obstacles within companies can be found about 60 years ago. The commencements can be seen in councils, committees, commissions for temporary meetings of members with different background, different functional experience, different organizations etc. with the intention to solve a special problem (Heinen 1974, p 157 sqq.). The expectation is that these kinds of groups have better chances to create new solutions for a given task due to the diversity of competences, due to short/quick flow of information and due to better coordinated and balanced decisions.

In the meantime these ideas have become more popular in commercial organizations using the expected benefits as indicated above as well as the additional ones, described already under the section "Weakness of traditional functional organization". 12 Manage defines: "The aim of this type of clustering of people is to boost diversity as it enhances creativity and social collaboration and to make sure that the various departments of the organization have a say in the project" and "are equally represented in the team". Subjects of these cross-functional teams are e. g. company strategy, cost saving programs, implementation of new technology etc., but the key application area for cross-functional teams - as elaborated above - is in design and NewPD (see also Haon et al. 2009). Both need creativity, input from a wide range of competence and vision to reduce cost, product development time and time to market in a way that preserves flexibility towards market changes.

2.3.Effects of competence (cross-functional) diversity on performance of NewPD – and the function of leadership

Haon et al. (2009) analyzed eighteen surveys made to observe direct effects of functional diversity on the performance of NewPD during the years 1988 and 2005. These surveys examined about 2000 projects/teams and more than 1400 managers had been interviewed.

The results were heterogeneous as well as ambiguous. The overall conclusions range from "Projects developed by cross-functional teams have a higher success rate than those from a single company function" (Larson and Gobeli, 1998) over "Diversity has a direct negative effect on the performance perceived by members of the team itself and on product innovation" (Ancona and Caldwell, 1992) to "Cross-functionality is associated with a higher success rate of new products" (McDonough, 2000).

To get a deeper understanding of the causes behind that heterogeneity Haon et al. (2008) decided to perform further surveys. What is obviously important for the success of cross-functional teams is not only the functional diversity as such, various conditions must be met to make a cross-functional team successful. Only the number of functions represented in a team is of marginal significance. The diversity of information and perspectives companies want to get, results to a large extent from competence diversity which cannot necessarily be achieved only by functional diversity. Individual competence, a cross-functional human property by nature (Javidan 1998), and a mixture of origin, cultural background, education, life career and professional career, experience and expertise, may differ largely within a functional department and may be relatively similar from members of different ones. With that understanding the notion diversity is extended to a compound term of functional, educational, experience and expertise diversity; this - extended - diversity has a positive influence on information and knowledge available in a team and enables the team for deeper thinking and for the creation of a broader range of perspectives considered to make decisions (e. g. Dahlin et al. 2005).

Under those conditions the possibility to develop a higher amount of different concepts for NewPD exists. On that broad base the team should be capable for a better instrumental use of success related information to solve specific problems. In the specific context of NewPD, the three main types of success related information pertain to information about customers, competitors and technology (Henard and Szymanski 2001).

All that describes the more functional say the mechanical aspect of possible success with teams, the potential embedded in teams. But as teams are constructs of individuals the socio-psychological aspect of team work and team leadership need adequate respect in order to make actually use of this huge potential. People tend to work with others who are - subjective perceived - similar to themselves, who have - subjective perceived - complementary skills, who have - subjective perceived - instrumental skills relevant to the group task and with whom they have worked already successfully in the past (Hinds et al. 2000); therefore diversity in a team is not by nature really qualified to establish the intended collaborative climate. Being aware of the negative implications of group dynamics team rules are helpful and commonly agreed at the very beginning of the activities. Such rules can be found in any groupings, political, commercial or sports and the rules in general consist of: be a good teammate, be part of the solution not the problem, professional conduct on and off the floor, total mutual support, put the team first (e. g. see FCB Basketball-Section-OVB 09.02.2012), and clarify goals and deploy them to all team members etc. (Kotelnikov n.d. - Toyota). These rules are subject to a careful management by a team leader, well-resourced with social competences. The motivation of the team members to achieve a common goal gets first priority. The question is, has the leader the personality and the leadership skills that make team members want to follow his way. When looking at the range of possible styles of leadership from the one extreme of commanding to the other extreme of a cooperative leadership (Heinen 1974, p 529), there is obviously a more participative (cooperative) style of leadership required, playing more a role of boundary spanning actor.

What is - apart others - helpful to overcome possible obstacles in respect to trust, generous share of information, open communication, reduced fear of peer judgment, easy, tacit understanding etc. is to a certain extend familiarity (Hinds et al. 2000, Haon et al. 2009). Also a study executed by Janssen et al. (2000, p 162 sq.) indicated that higher familiarity led to more critical and exploratory group norm perceptions, and more positive perceptions of collaboration.

Taking all this into account Haon et al. (2009) developed the three hypotheses for NewPD teams:
(1) Greater competence diversity increases the degree of instrumental use of available information,
(2) higher degree of instrumental use of available information improves the performance of the new products and 3) stronger familiarity among team members intensifies the positive effects of competence diversity on the level of instrumental use of available information. Figure 4 visualises the complexity of that causal model quite clearly.

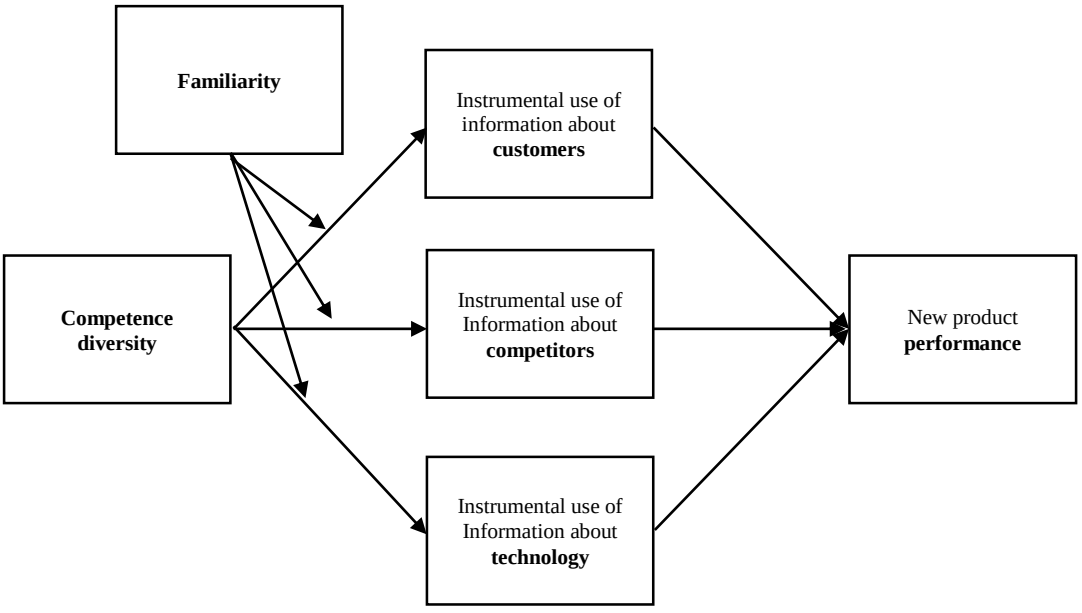

Figure 4. *Research Hypotheses*
Source: (Haon et al. 2008 – modified by the author)

2.3. Survey results of Haon et al.

To validate their hypotheses - and to show that the undifferentiated use of diversity and ignoring familiarity by managers and team leaders are above all responsible for the heterogeneous outcome of the surveys made during the years 1988 and 2005, as described above - (Haon et al. 2008) survey NewPD teams by interviewing one respondent from each team who has taken part in a recent development project and can describe that project effectively. For large firms, they interview product managers, for small and medium-sized enterprises sales managers; the respondents represent all 58 French industrial sectors. Special attention was directed to a elaborate reference/discussion of the adequate methods used for the analysis of all collected data in respect of reliability and validity, comprising the terms as formative indicators, index construction, multicollinearity, variance inflation factor, exploratory factor analysis, convergent and discriminant validity, path analysis, confirmatory factor analysis etc., according to the latest state of the art to examine cause-effect relations in social sciences, outlined for example by Eberl (2004) or Weiber and Mühlhaus (2010).

In fact this solid analysis confirmed the hypotheses to a broad extend. What was not validated is the interaction between familiarity and diversity on the use of information about customers. "This effect could indicate that information about customers is considered central to developing new products and, as a consequence, is used regardless of who the team members are" (Haon et al. 2008, p 82 sq.). Nevertheless there are strong arguments for the importance of familiarity, as the moderating effect concerning diversity and instrumental use of information about competitors and technology is highly significant. It is just the benefit of the detailed design of the model of Haon et al. (2008) that the crucial characteristic of familiarity is made evident for managers and team leaders.

3. Research - Premises, Methodology and Analysis

3.1. Conclusion and Implication on the Research Question

From a general managerial point of view - and this includes the viewpoint of mechanical development departments of medium-sized companies within 3D CAD conditions - the summary of the discussion of cross-functional teams and leadership range from a need to change the terminology to personal development aspects, to rules for the composition of teams and to some vital traits of leadership in that specific environment:

- The idea behind cross-functionality is more precisely addressed by competence diversity. Therefore the term cross-functionality is better replaced by competence diversity as only competence diversity can guarantee that variety of information and knowledge required for optimal decision making, which cross-functionality is not necessarily able to establish. Talking of competence diversity teams rather than cross-functional teams is more operational in respect to the actions to be taken by managers and team leaders composing coherent teams.
- Human resources departments should promote and control interpersonal diversity by hiring and training and thus support the team composition processes.
- When designing a team diversity and familiarity aspects must play the key role from the very beginning.
- To obtain the positive effects of competence diversity on new product performance management and team leader must actively encourage the team members to make use of the richness of information and knowledge available by competence diversity.
- As competence-diversity-benefits can be leveraged through higher familiarity among team members management and team leader must highly emphasize the development and maintenance of a productive collaboration climate.

Since globalization has already captured wide areas of all business activities the composition of new teams is no longer restricted to team members of a single cultural circle. Therefore the next question to be investigated is how cultural diversity effects competence diversity and leadership? Which measures are to be taken for a coherent combination of multicultural competences, e. g. education of undergraduate or graduate students in multicultural management skills, limited deployment abroad etc.? One conclusion already drawn from a study conducted by Ho Chye Kok (2007) is that the successful management of tacit organizational knowledge sharing requires a deep understanding of the specific cultural values that underpin both behavior and organizational culture.

Another problem could arise from the viewpoint of individual work satisfaction. As team members perceive an additional pressure to success they may expect some compensation by corresponding rewards. Will these hopes be met or is there a new way of exploitation of labor emerging.

The results obtained by this discussion of competence (cross-functional) diversity and leadership are

- as already stated - applicable in general i. e. for major industrial enterprises as well as for mechanical development departments of medium-sized companies within 3D CAD conditions, the subject of the management project in preparation referenced under paragraph 1. This paper is understood to contribute to this project discussing measures for the establishment of coherent team structures. The proposal intends to demonstrate that management in focusing continuously on the improvement of organization to enable technology innovation or to cope with the challenges of the world wide finance and economy crises or to increase operational effectiveness must not lose the view for the single working units in their companies. For example by analyzing the deployment of an all commercial processes integrating software (e. g. 3D CAD) there is easily danger to pass out of mind the everyday work life of single productive units. To create competence diversity is not only a global organizational task, management must in parallel integrate this requirement adequately into single productive units to enable efficient work. Further research should be carried out under deeper consideration of this aspect.

3.2. Causal Model

Coming back to the basic hypothesis: "The higher the technical draughter's integration intensity in a 3D CAD product development project, the higher the economic and socio-psychological efficiency within that project" outlined under paragraph 1 an evident outcome of that functional/competence diversity discussion is that in the process of constructing rules for the composition of a coherent team structure in mechanical development departments of medium-sized companies competence diversity and familiarity must be taken into account adequately. The placement and tracking of that aspect in the cause-effect-model designed for the related management project is indicated with figure 5. The causal model for socio-economic analysis, which is in generation, shows possible cause-effect relations between different team constellations in NewPD teams under 3D CAD conditions and the economic and the socio-psychological efficiency. The structural dependent variable Y, the economic efficiency, will be measured by the endogenous latent variables as meeting of project deadlines, the workload, project costs, project duration, the number of concepts, the number of drawing errors and the long term benefit to counter the shortage of engineering resources. The structural dependent variable Z, the socio-psychological efficiency, is indicated by the engineer's methodical responsibility during the creative phase of product development, the engineers/drafters contentment with the employment and the acceptance with the project proceedings. The independent structural variable X, the technical draughters integration intensity in a 3 D CAD NewPD project, is indicated by the distribution of drawings which must be generated in a defined standard project, the team structure and the education level of the team members (degree of compliance with the NewPD task), all further NewPD activities concerning product documentation and the NewPD training intensity of both the technical draughtsperson and the engineer, best explained with the call for competence diversity. The main flow of possible impacts of cross-functionality resp. competence diversity expected on X, Y and Z is specifically marked in red. The actual strength of the expected effects will be identified applying two methods. On the one side a broad-based study is in preparation in medium sized companies using questionnaires. Participants of recent NewPD projects (variant constructions) - engineers and drafters - will be asked accordingly to falsify respectively verify the model. On the other side defined standard projects are to be executed at various levels of selected independent variables in an experimental field study. By arranging stress tests the model must prove its reliability. If the real environment and the model match for selected parameters, the conclusion can be drawn that the model reflects the aspects of reality sufficiently.

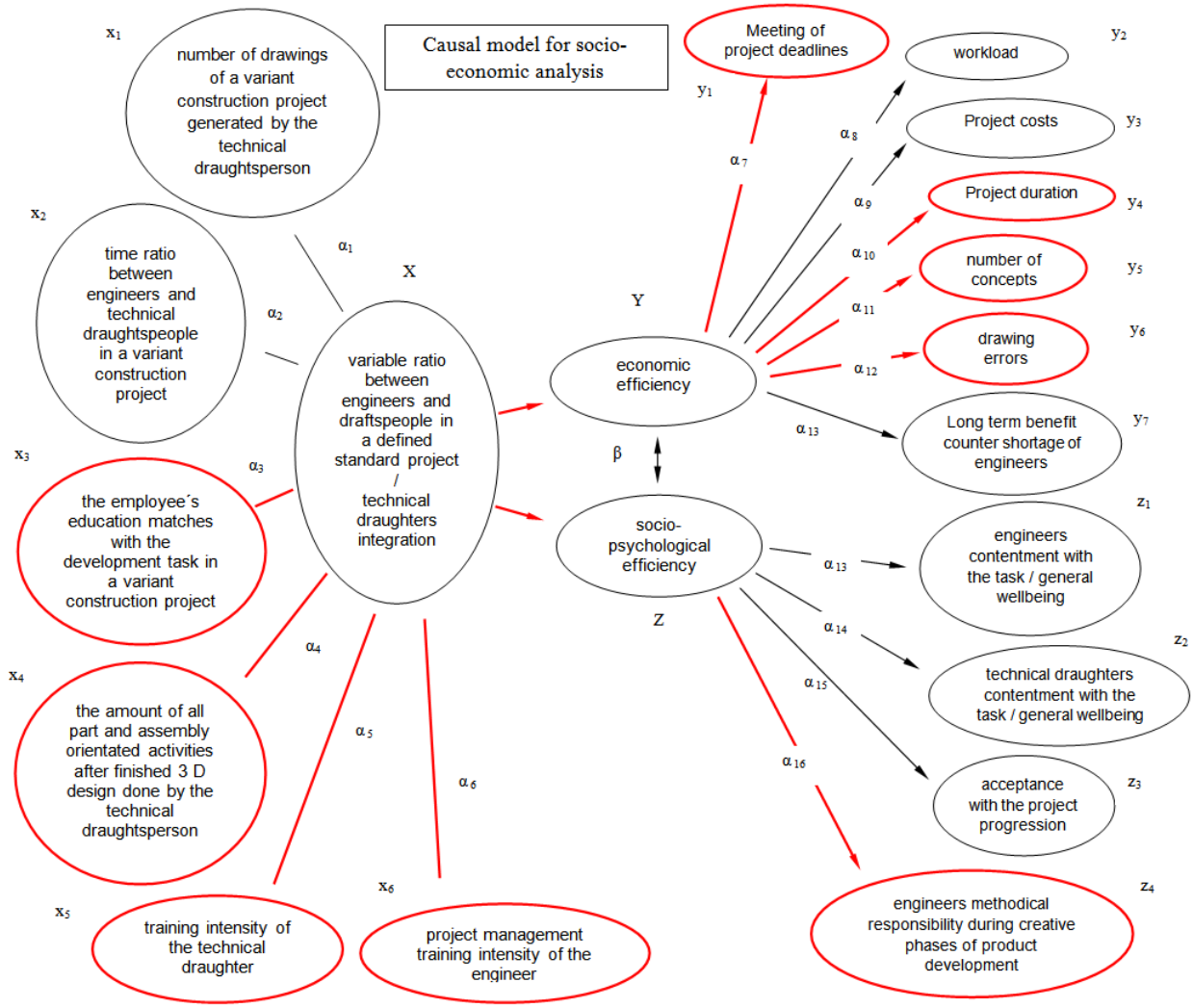

Figure 5. *Causal Model - Main Flow of Impacts from Competence Diversity*
Source: Author

Legend for the causal model:

X	= independent structural variable
x_1... x_6	= latent exogenous variables (measurement variables)
Y, Z	= dependent structural variables
y_1 ...y_7	= latent endogenous variables (measurement variables)
z_1… z_4	= latent endogenous variables (measurement variables)
α_1 … α_{16}	= correl. degrees of dependence between structural & measurement variables
β	= correlative degree of dependence between dependent structural variables

4. Discussion and Conclusion

With this paper a central elements of the causal model in discussion is addressed. Further components such as division of labor, modern PD methods and task satisfaction respectively cognitive dissonance must be considered accordingly in order to elaborate a solid theoretical and empirical basis necessary to supported the assumption of causality (Weiber & Mühlhaus, 2010, p. 13 sq.). After these additional comprehensive studies the scientific evaluation of the proposed causal relation between a coherent team structure and socio-economic efficiency in selected areas of NewPD within a 3D CAD environment can be performed and conclusions and suggestions inferred. A coherent solution for the imbalanced allocation of personal resources in NewPD is likely

5. References

Ancona, D. G., and Caldwell D., 1992. Demography and design: predictions of new product team performance. *Organization Science* 3, pp. 321-341.

BMBF 2004. *Bundesbericht Forschung*. http://www.bmbf.de/pub/bufo2004.pdf (accessed 12 11, 2005).

BMBF 2011. Bundesregierung setzt konsequent auf Bildung und Forschung - 06.07.2011 [Pressemitteilung 095/2011]. http://www.bmbf.de/press/3121.php (accessed 12 08, 2013).

Dahlin, K. B., Weingart, L. R., and Hinds, P. J. 2005. Team diversity and information use. *Academy of Management Journal* 48, no. 6, pp. 1107–1123.

Eberl, M. 2004. *Formative und reflektive Indikatoren im Forschungsprozess: Entscheidungsregeln und die Dominanz des reflektiven Modells.* 19. München: EFOplan.

Ehrenspiel, K. 2007. *Integrierte Produktentwicklung: Denkabläufe, Methodeneinsatz, Zusammenarbeit.* München/Wien: Hanser.

Ehrenspiel, K. 1995. *Integrierte Produktentwicklung. Methoden für Prozessorganization, Produkterstellung und Konstruktion.* München Wien: Carl Hauser Verlag.

Führberg-Baumann, J. and Müller R., 1991. Neugestaltung der Auftragsabwicklung. *VDI-Z133*, pp. 52-57.

Gutenberg, E. 1966. *Grundlagen der Betriebswirtschaftslehre. Erster Band: Die Produktion.* Berlin etc.: Springer.

Haon, C., Gotteland D. and Fornerino M., 2009. Familiarity and competence diversity in new product development teams: Effects on new product performance. *Market Lett* 20, pp. 75-89.

Heinen, E. *Industriebetriebslehre.* 3. Wiesbaden: Gabler, 1974.

Henard, David H, and David M. Szymansk. "Why some new products are more successful than others." *Journal of Marketing Research* 38, no. 3 (2001): 362-375.

Hinds, P.J., Carley K.M. and Krackhardt D. 2000. Choosing Work Group Members: Balancing Similarity, Competence and Familiarity. *Organization Behaviour and Human Decision Processes* 81, no. 2, pp. 226-251.

Hirzel, M. 1992. Mit Geschwindigkeit im dynamischen Markt reüssieren. *(Eds.), Speed-Management: Geschwindigkeit zum Wettbewerbsvorteil machen*, by Hirzel/Leder/Partner, 19-26. Wiesbaden: Gabler.

Ho-Chye-Kok. 2007. Cultivating Knowledge Sharing: An Exploration of Tacit Organizational Knowledge in Singapore. *Journal of Asian Business* 22/23 Issue, no. Issue 2/3/1, pp. 169-187.

IAB 2011. Berufe im Spiegel der Statisitk. Edited by Institut für Arbeitsmarkt und Berufsforschung / Forschungseinrichtung der Budesagentur für Arbeit. http://bisds.infosys.iab.de/bisds/result?region=19&beruf=BG60&qualifikation=2 (accessed 11 29, 2013).

Janssen, J., Erkens G., Kirschner P. A. and Kanselaar G. 2009. Influence of group member familiarity on online collaborative learning. *Computers in Human Behaviour* 25.

Javidan, M. 1998. Core competence: what does it mean in practice. *Long Range Planning* 31, pp. 60-71.

Kliesch-Eberl, M. and Eberl P. 2009. An extended perspective on innovation: Bridging organizational creativity to dynamic capabilities. *EGOS Colloquium, Barcelona 2009.* Barcelona: EGOS Colloquium, pp. 1-6.

Kotelnikov, V., n.d. Cross-functional Management (CFM) - Building a Better Synergistic System for Quality, Cost, and Delivery, and Innovation (Toyota). http://www.1000ventures.com/busines _guide/mgmt_cross-functional.html (accessed 12 10, 2013).

Larson, E. W. and Gobeli D. H. 1988. Organizing for product development projects. *Product Innovation Management* 5, no. 3, pp. 180-190.

McDonough, E. F. 2000. Investigation of factors contributing to the success of cross-functional teams. *Journal of Product Innovation Management* 17, no. 3, pp. 221-235.

Scheer, A-W. 2003. *Real-Time Enterprise: mit beschleunigten Managementprozessen Zeit und Kosten sparen.* Berlin: Springer.

Weiber, R. and Mühlhaus D. 2010. *Strukturgleichungsmodellierung.* Berlin Heidelberg: Springer-Verlag Berlin Heidelberg.

Wittenstein, A-M. 2007. Bedarfssynchrone Leistungsverfügbarkeit in der kundenspezifischen Produktentwicklung. *IPA-IAO Forschung und Praxis.* Heimsheim: Jost Jetter Verlag.

12manage. 2013. http://www.12manage.com/images/picture_ cross_functional (accessed 12 15, 2013).